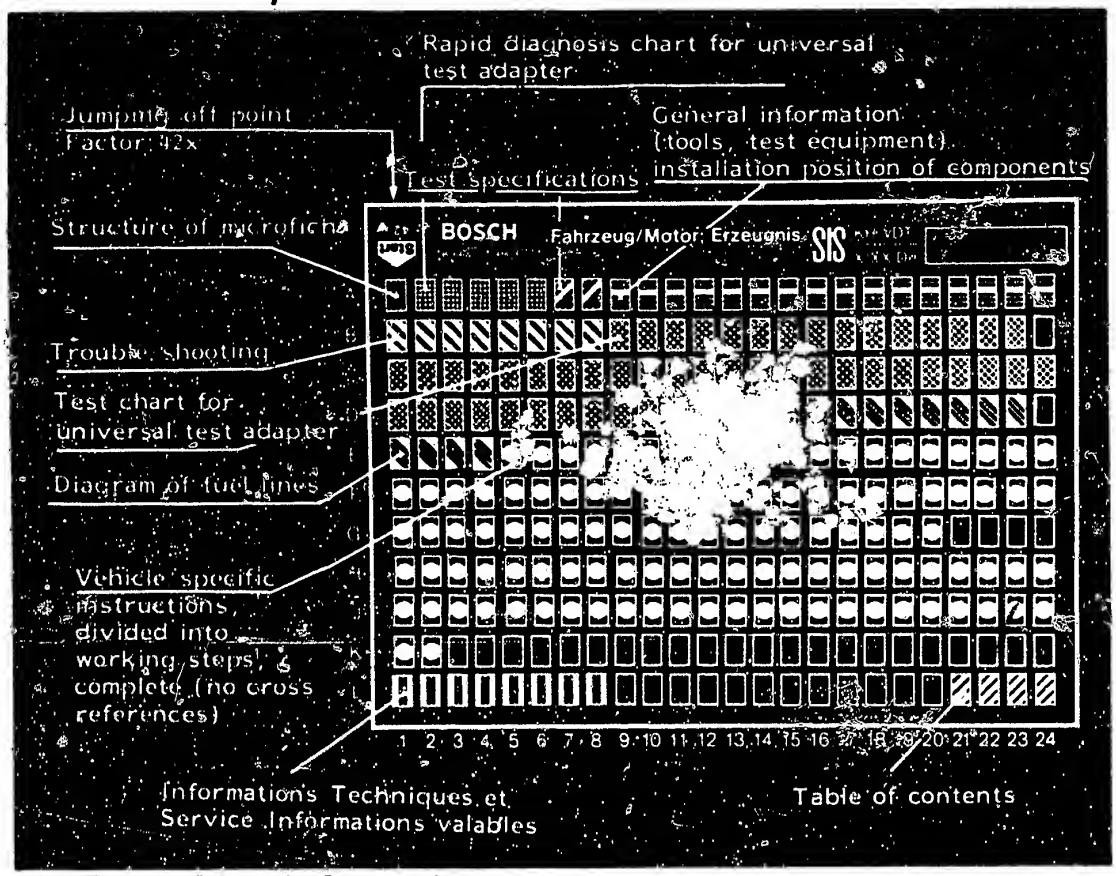
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1	Trouble-Shooting Plan	↓

Rapid diagnosis chart for universal test adapter

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

- Switch positions on the universal test adapter
- Sequence of test steps
- Notes on how to operate the universal test adapter or other components
- Readings on the multimeter
- References to coordinates of the relevant detailed testing and trouble-shooting program.

If detailed information and instructions are necessary, always proceed according to the trouble-shooting program starting on Coordinate B1/B2.

Rapid diagnosis chart for universal test adapter

Test step	Switch position V	Switch position Ω	Remarks	Test specifications (reading)	See Coordinate for trouble-shooting
1	3	-	Shift gear to neutral. Operate starting motor. Measure voltage.	8 ... 15 V	B 11
2	4	-	Shift gear to neutral. Operate starting motor. Measure voltage	8 ... 15 V	B 15
3	5	-	Shift gear to neutral. Operate starting motor. Measure voltage pulses with motortester.	Ignition pulses on motortester	B 21
4	6	-	Ignition "ON". Measure voltage.	8 ... 15 V	C 1
5	7	-	Ignition "ON". Measure voltage.	8 ... 15 V	C 4
6	8	-	Ignition "ON". Measure voltage.	8 ... 15 V	C 7
7	9	-	Ignition "ON". Measure voltage.	8 ... 15 V	C 10
8	10	-	Ignition "ON". Measure voltage.	8 ... 15 V	C 13
9	11	-	Ignition "ON". Deflect air-flow sensor flap. Measure voltage.	8 ... 15 V	V 16

Rapid diagnosis chart for universal test adapter

Test step	Switch position V	Switch position Ω	Remarks	Test specifications (reading)	See Coordinate for trouble-shooting
10	↓	6	Measure resistance. Deflect air-flow sensor flap.	40...300 Ω 0 280 202 006 (as of FD 141): 80...600 Ω	C 19
11	↓	7	Measure resistance.	130...260 Ω 0 280 202 006 (as of FD 141): 260...520 Ω	C 21
12	↓	8	Measure resistance.	200...400 Ω 0 280 202 006 (as of FD 141): 400...800 Ω	C 23
13	↓	9	Measure resistance. Accelerator in rest position.	0... 10 Ω	D 1
14	↓	10	Accelerator in full-load position. Measure resistance.	0... 10 Ω	D 3
15	↓	11	Measure resistance.	30Ω...30kΩ (depends on temperature)	D 5
16	↓	12	Measure resistance.	30Ω...30kΩ (depends on temperature)	D 7
17	↓	13	Measure resistance.	0... 10Ω	D 9
18	↓	14	Measure resistance.	0... 10Ω	D 11

B7

Idle speed
Manually-shifted transmission

1.9 l engine	975...1025 min^{-1}
2.0 l engine	850... 900 min^{-1}

Exhaust-gas setting, CO concentration
(with engine at normal operating temperature)

1.9 l engine:	max. 1.5 % by vol. CO
2.0 l engine:	max. 1.0 % by vol. CO

Fuel pump delivery: min. 650 cm^3/30s

Solenoid-operated injection valve

Electrical internal resistance:	2.0...3.0 Ω
Series resistance:	5.0...7.0 Ω

Temperature sensors

Electrical internal resistance	NTC I (air)	NTC II (engine)
At ambient temperature (approx. + 15° - + 30°C)	1.45...3.3 kΩ [1) 2)]	1.3...3.6 kΩ [1)]
with engine at op. temp. (approx. + 80°C)	280...360Ω [1) 2)]	250...390Ω [1)]

[1)] 1.9 l engine [2)] 2.0 l engine

Start valve (only on 1.9 l engine)
Electrical internal resistance: 3.5...4.5Ω

B5

Auxiliary-air device
Electrical internal resistance

for 0 280 140 114:	40...75Ω
for 0 280 140 104, .. 112, .. 121:	35...70Ω

Fuel pressure: 2.8...3.2 bar

B7

Thermo-time switch (only on 1.9 l engine):

Electrical internal resistance	Between Term. "G" + ground	Between Term. "W" + ground	Between Term "G" + "W"
at ambient temperature (below + 30°C)	25...40 Ω	0 Ω	25...40 Ω
with engine at op. temp. (above +40°C)	50...80 Ω	100...160 Ω	50...80 Ω

B5

Air-flow sensor

Electrical internal resistance

Resistance between term. 7 and term. 8
(Deflect air-flow sensor flap slightly)

0 280 200 003,..202 006,..202 009: 100...500 Ω
0 280 202 006 as of FD 141: 200...1000 Ω

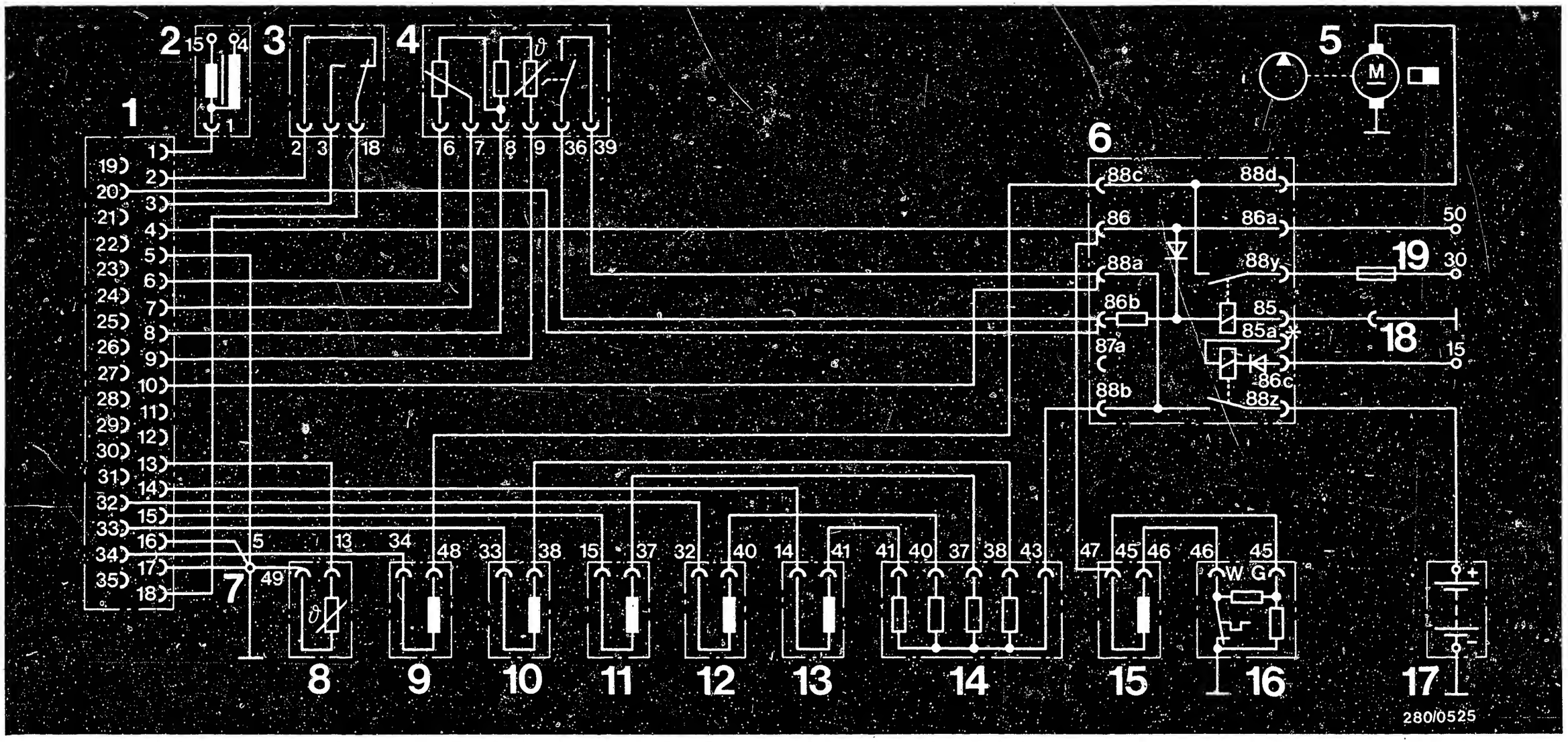
as of FD 246: Hexagon-socket-head cap screw for CO adjustment (AF 5).

Relay set

Ohmmeter between term. 86 b (positive) and term. 85.

0 332 514 103,..109: 50...110Ω
0 332 514 124: 70...500Ω

See equipment and Autodata microfiche for settings for ignition, valve clearance and other engine data.

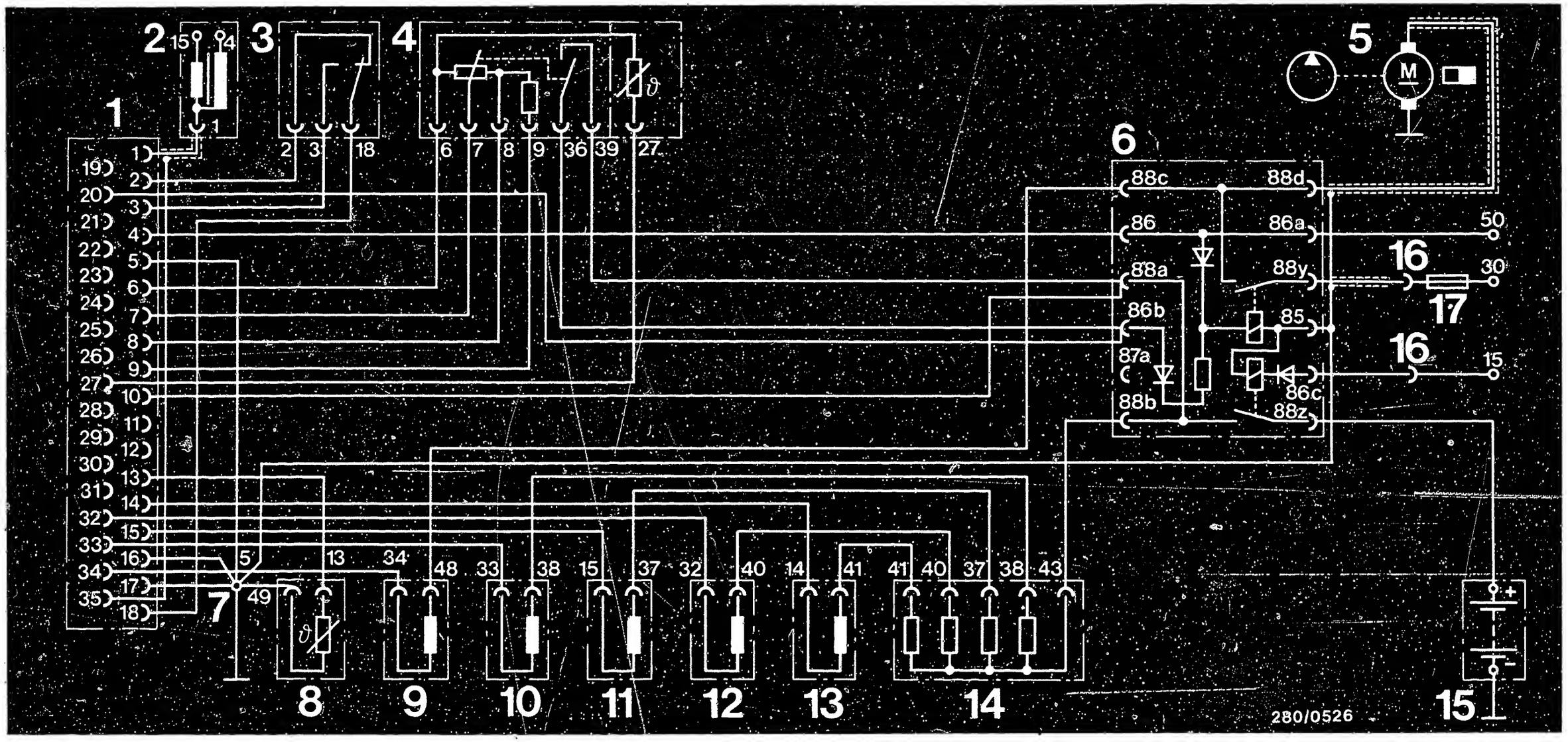


ELECTRICAL TERMINAL DIAGRAM OF L-JETRONIC (for 1.9 l engine)

1 = Multiple plug
2 = Ignition coil
3 = Throttle-valve switch
4 = Air-flow sensor
5 = Electric fuel pump
6 = Relay set
7 = Central ground
8 = Temperature sensor II
9 = Auxiliary-air device
10 = Injection valve cyl. 2
11 = Injection valve cyl. 1
12 = Injection valve cyl. 3
13 = Injection valve cyl. 4
14 = Series resistor
15 = Start valve
16 = Thermo-time switch
17 = Battery
18 = Relay ground terminal:
Manta A: on body (short lead)
Manta B: on central ground terminal (long lead No. 50)

19 = Pump fuse

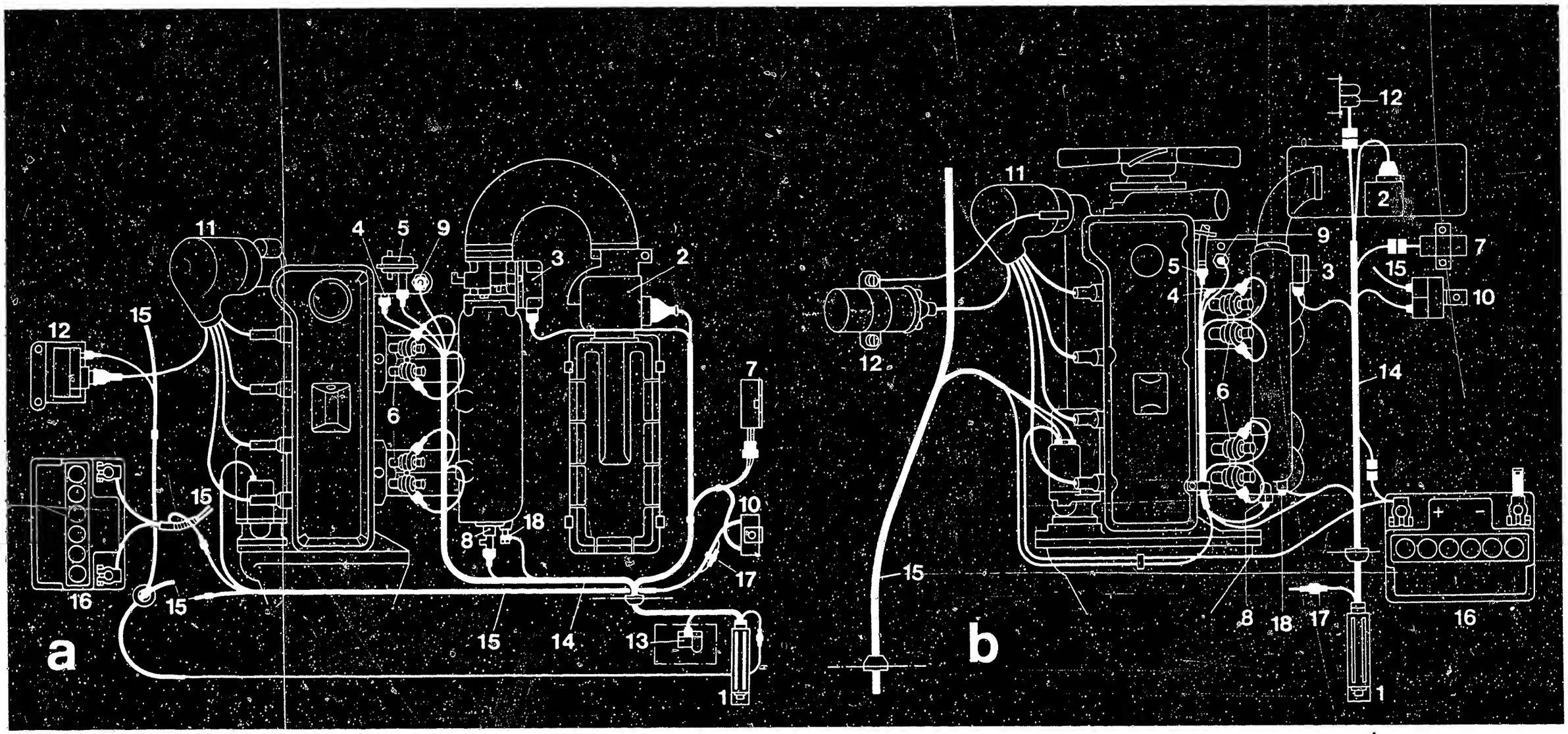
* applies only to relay set 0 332 514 101



ELECTRICAL TERMINAL DIAGRAM OF L-JETRONIC (for 2.0 l engine)

1 = Multiple plug
2 = Ignition coil
3 = Throttle-valve switch
4 = Air-flow sensor
5 = Electric fuel pump
6 = Relay set
7 = Central ground
8 = Temperature sensor II
9 = Auxiliary-air device
10 = Injection valve cyl. 2
11 = Injection valve cyl. 1
12 = Injection valve cyl. 3
13 = Injection valve cyl. 4
14 = Series resistor
15 = Battery
16 = 3-pin plug connector
17 = Pump fuse

D_1 = only in relay set 0 332 514 124

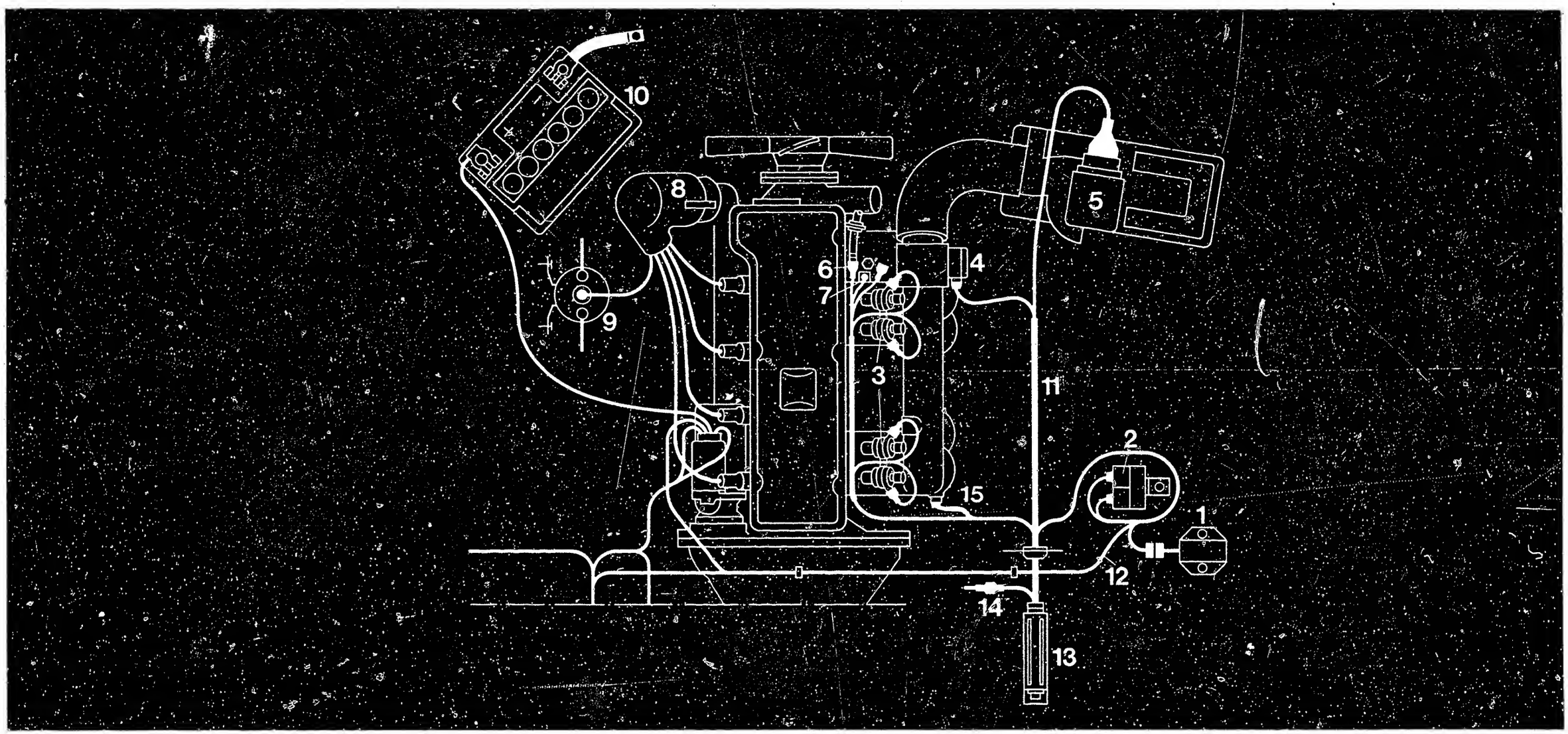


a = Manta A (Kadett GT/E similar) 1.9 l engine

b = Manta B 1.9 l engine

ELECTRICAL WIRING DIAGRAM OF L-JETRONIC AND ARRANGEMENT OF INDIVIDUAL COMPONENTS

1 = Control unit
2 = Air-flow sensor
3 = Throttle-valve switch
4 = Temperature sensor II
5 = Auxiliary-air device
6 = Injection valves
7 = Series resistors
8 = Start valve
9 = Thermo-time switch
10 = Relay set
11 = Ignition distributor
12 = Ignition coil
13 = Altitude sensor
14 = Wiring harness (Jetronic)
15 = Vehicle wiring harness
16 = Battery
17 = Pump fuse
18 = Central ground



REKORD 2.0 l ENGINE (Manta 2.0 l engine, Kadett 2.0 l engine similar)

1 = Series resistor
2 = Relay set
3 = Injection valves
4 = Throttle-valve switch
5 = Air-flow sensor
6 = Auxiliary-air device
7 = Temperature sensor II
8 = Ignition distributor
9 = Ignition coil
10 = Battery
11 = Jetronic wiring harness
12 = Vehicle wiring harness
13 = Control unit
14 = Plug connector to ignition coil term. 1
15 = Central ground

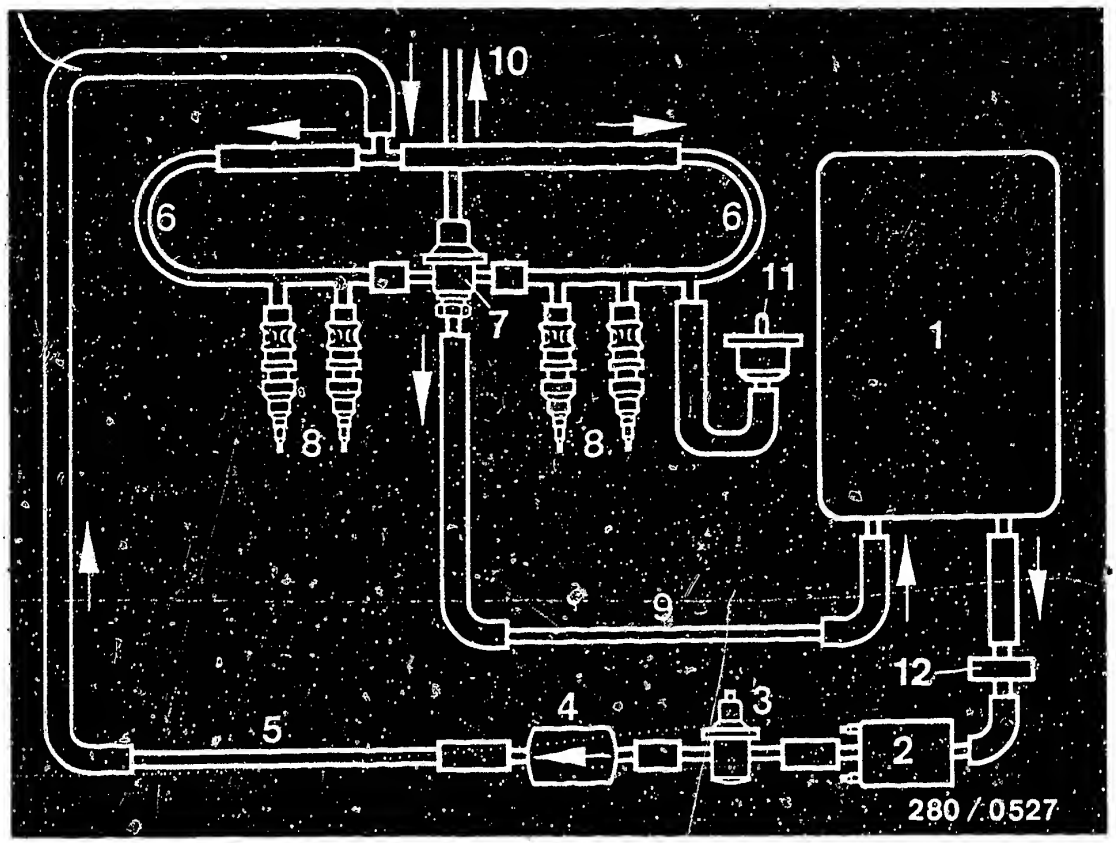


DIAGRAM OF FUEL LINES

1 = Fuel tank
2 = Electric fuel pump
3 = Fuel-pressure damper
4 = Fuel filter
5 = Fuel delivery line
6 = Fuel ring main
7 = Pressure regulator
8 = Injection valves
9 = Fuel return line
10 = Connection to intake manifold
11 = Start valve (1.9 l engine only)
12 = Strainer (on intake side)

TEST EQUIPMENT AND TOOLS

Description	Designation	Part No.
Universal test adapter (analog)	ETT 018.01	0 684 101 801
Adapter lead		1 684 463 129
Motortester	e.g. MOT 002.00 MOT 300 MOT 400	0 684 000 200 0 684 000 300 0 684 000 400
Exhaust-gas tester Calibrated instruments:	e.g. ETT 008.00 ETT 008.04 or ETT 008.05	0 684 100 800 0 684 100 804 0 684 100 805
Test lead		1 684 463 093
Electrotester or Multimeter	e.g. ETE 014.00 MMD 301 Fa. Philips Fa. Miselco Fa. Fluke	0 684 101 400 0 684 500 301 PM 2517 X Master 50 K Multimeter 75 / 77
Tester for delivered quantity comparison		KDJE-P 200
Reference valve (new injection valve)	up to 8.75 as of 9.75	0 280 150 104 0 280 150 105
Spacer sleeves		KDJE-P 200/16/7
Pressure gauge	Quality class 1.0 = 6 bar 0.1 bar graduations	1 687 231 154
Three-way line		KDJE-P 100/13
Pressure tester or Pressure tester (no longer available)		KDJE-P 100 KDEP 1034
Clamping fixture		1 688 120 093
Assembly mandrel		1 687 931 003
Parts set		1 287 010 701
Hexagon-socket-screw key AF 5		Commercially available

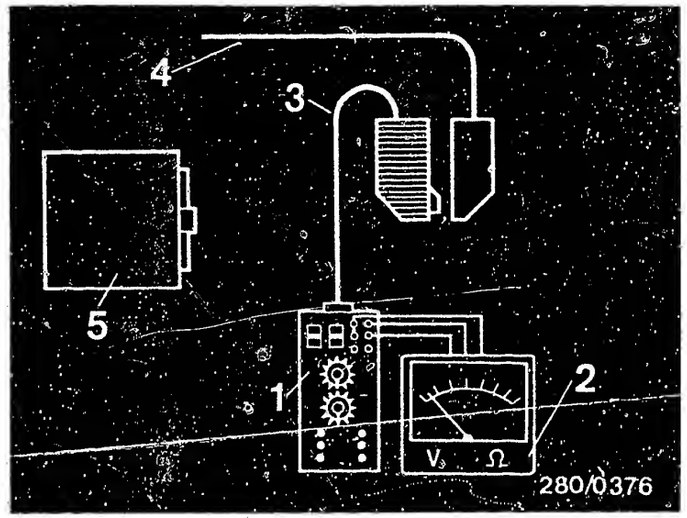
Explanatory notes on universal test adapter with adapter lead for L-Jetronic (Part No. 1 684 463 129)

General:
The universal test adapter is connected to the vehicle wiring harness with the adapter lead.

Caution:
Connect and disconnect the universal test adapter only with the ignition off!

Testing:

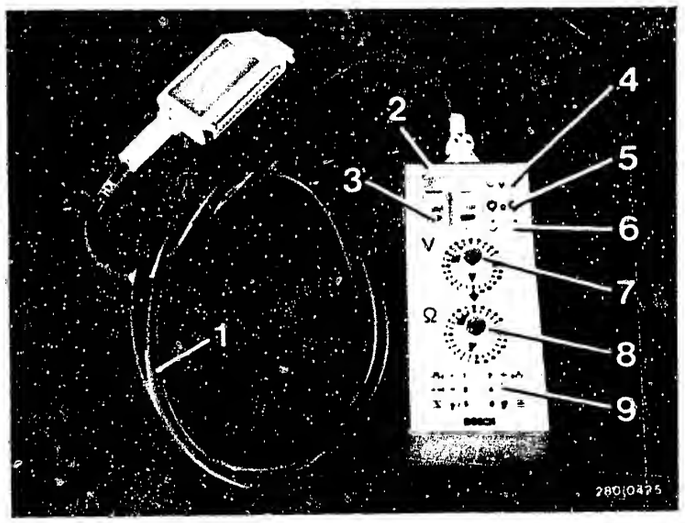
For testing connect a multimeter with R_i min. 20 kΩ/V to the test adapter.
In addition, the signal from term. 1 of the ignition coil can be measured with a motortester via the special input.

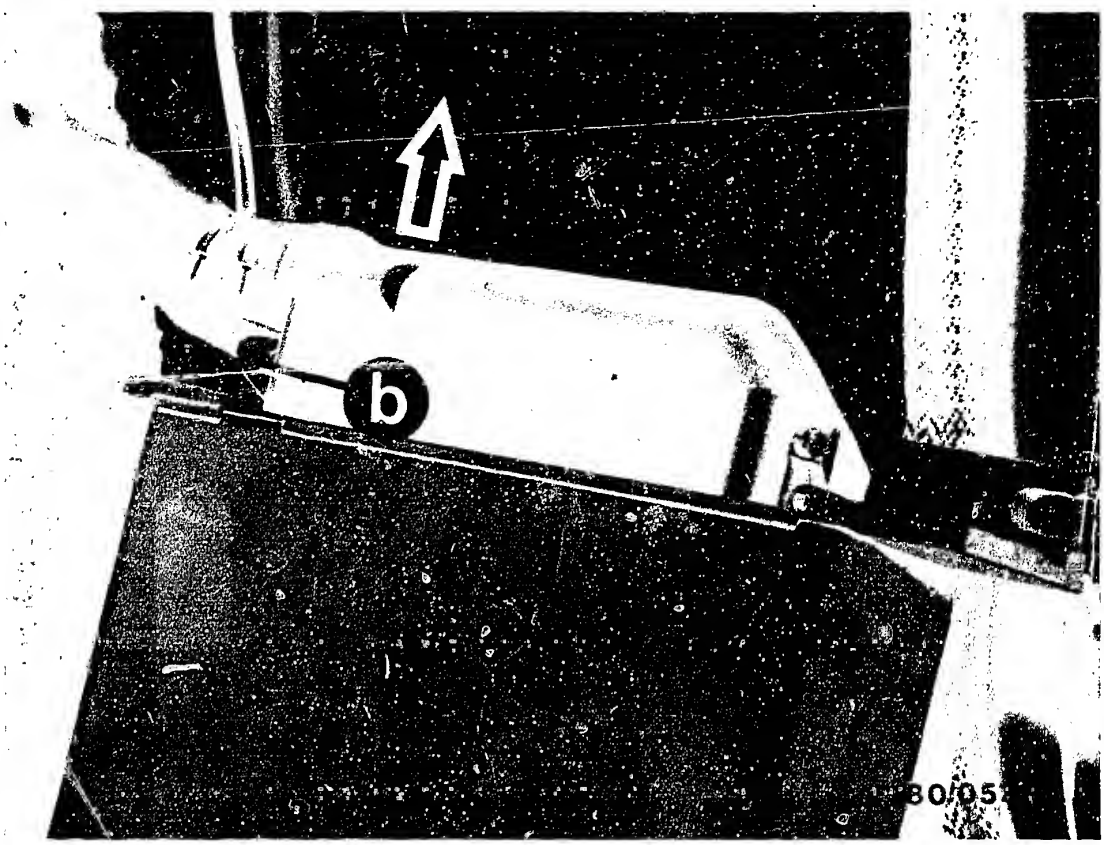


1 = Universal test adapter
2 = Multimeter
3 = Adapter lead (L-Jetronic)
4 = Vehicle wiring harness
5 = L-Jetronic control unit

Universal test adapter with adapter lead for L-Jetronic

1 = Adapter lead (Part No.: 1 684 463 129)
2 = Universal test adapter (Part No.: 0 684 101 801)
3 = Test wells (for motortester)
4 = Test sockets (for voltage measurement)
5 = Test sockets (for resistance measurement)
6 = Test sockets (not occupied)
7 = Program switch "V"
8 = Program switch "Ω"
9 = Button panel (not occupied for L-Jetronic)





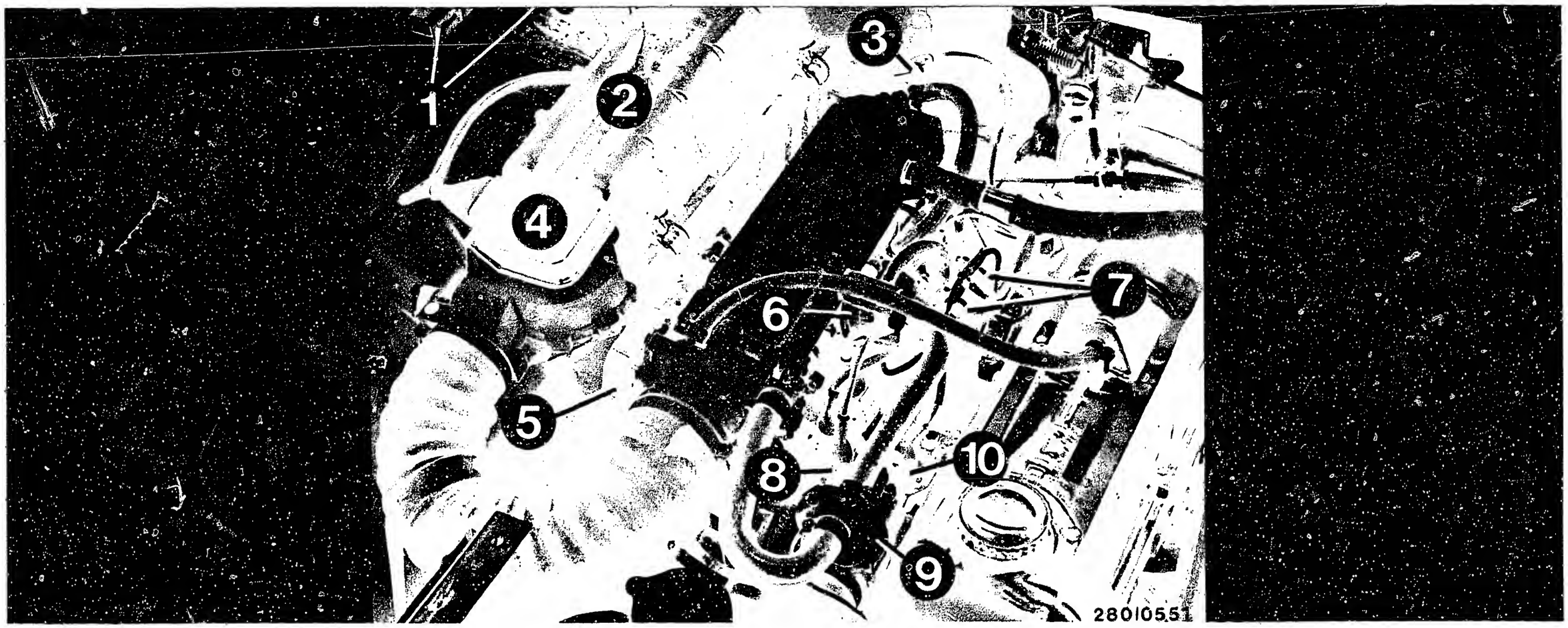
INSTALLATION POSITION OF COMPONENTS

The indications "left" and "right" always refer to the forward direction of travel

Control unit

The control unit is in the passenger compartment, on the front passenger side, in the footwell at the bottom right.

To remove the control unit, take out the side panelling on the right of the front passenger side footwell. Unscrew both control unit fastening screws. Press the detent b to the rear so that the plug unlatches. Hinge up the plug in the direction of the arrow.



INSTALLATION POSITION OF COMPONENTS Opel 1.9 l engine (2.0 l engine similar)

1 = Relay set and series resistors
2 = Air filter
3 = Start valve (blue plug) (not on 2.0 l engine)
4 = Air-flow sensor
5 = Throttle-valve switch
6 = Pressure regulator
7 = Injection valves
8 = Thermo-time switch (brown plug) (not on 2.0 l engine)
9 = Auxiliary-air device
10 = Temperature sensor II (white plug) 1.9 l engine
Temperature sensor II (blue plug) 2.0 l engine

Electric fuel pump and fuel filter: Manta; Ascona: On right near rear axle
Kadett: In center of luggage compartment, behind a cover
Rekord: Pump in front of and filter behind rear axle on right-hand side.

Important general information

1. Never start engine without securely connected battery.
2. Do not use a starting aid with more than 16 V or a fast charger for starting.
3. Never disconnect battery from vehicle electrical system with engine running.
4. Disconnect battery from vehicle electrical system when fast charging.
5. Remove control unit at temperatures above 80°C (paint-drying installation).
6. Ensure that all connectors of wiring harness are properly attached.
7. Never connect or disconnect wiring-harness plug of control unit with ignition switched on.
8. When testing compression, cut the red power supply lead between battery and relay set by disconnecting the plug-in connection.
   This ensures that the voltage supply for the L-Jetronic and therefore also for the injection valves is interrupted. Undesired injecting is thus prevented.
9. Remove the L-Jetronic control unit before carrying out electric welding work (e.g. spot welding).
10. When using the following trouble-shooting program it is assumed that the engine is in proper working order and that the ignition is correctly set. The electrical system must be checked and, if necessary, repaired.

In order to carry out the testing operations described in this manual and in order to assess the components, you should be familiar with the L-Jetronic and how it works. The essential points regarding the operation and construction of the L-Jetronic are described in Technical Instruction VDT-U 3/3 En.

Trouble-shooting

The following trouble-shooting programs are designed to enable workshop employees, using the universal test adapter with adapter lead (1 684 463 129) and other suitable test equipment, to quickly locate causes of trouble on the L-Jetronic.
Depending on the level of knowledge and experience of the mechanic, a choice can be made between the following procedures:

B3
B5

- detailed step-by-step trouble-shooting for employees with little experience or practice on L-Jetronic vehicles
- pin-pointed direct trouble-shooting for trained, experienced employees who have had a great deal of practice on L-Jetronic vehicles.

Both trouble-shooting programs begin by checking the electrical part of the L-Jetronic with the aid of the universal test adapter with adapter lead. This makes it possible in a short space of time to check the electrical operation of the wiring harness with the connected components and to quickly detect faults.
If no fault is found with the universal test adapter with adapter lead, the fuel pressure test must be performed.

If this also reveals no fault, continue with the detailed or direct trouble-shooting program.

1. Detailed step-by-step trouble-shooting

1.1 Test with L-Jetronic tester

This test must come at the beginning of the test program and must be performed from beginning to end (Coordinates B9... D13).

1.2 Fuel pressure test

This test must come after the test with the universal test adapter and must be performed from beginning to end (Coordinates D14-E4).

1.3 Trouble-shooting according to customer complaints (fault symptoms)

The table below contains possible fault symptoms and the right-hand column gives the first coordinate of the respective detailed trouble-shooting program.
This trouble-shooting program consists of logically ordered test procedures for all individual components of the L-Jetronic. If, after completing the trouble-shooting program for an assumed fault, the fault has not been detected or remedied, chose a new fault symptom and work through a different program.

Customer complaint (symtom of trouble)	Universal test adapter	Fuel pressure test	Coordinate
1. Engine fails to start or starts only with great difficulty	B 9	D 14	E 5
2. Engine starts but then dies	B 9	D 14	E 21
3. Uneven engine idle	B 9	D 14	F 9
4. Poor throttle take-up	B 9	D 14	G 6
5. Engine missing under all operating conditions	B 9	D 14	H 1
6. Fuel consumption too high	B 9	D 14	H 17
7. No mamimum engine power	B 9	D 14	J 7
8. CO concentration at idle too high or too low	B 9	D 14	J 17

2. Pin-pointed direct trouble-shooting

2.1 Test with universal test adapter with adapter lead 1 684 463 129

The test with the universal test adapter must come at the beginning of the test program and must be performed from beginning to end (Coordinates B 9 - D 13).

2.2 Fuel pressure test

The fuel pressure test must come immediately after the test with the universal test adapter and must be performed from beginning to end (Coordinates D 14 - E 4).

2.3 Trouble-shooting according to customer complaints

The table below contains various symptoms of trouble with several possible causes of the trouble in each case. The coordinate reference field indicates the first coordinate of the test procedure for the respective L-Jetronic component. If, after testing the individual components, the fault has not been detected or remedied, choose a new symptom of the trouble.

Customer complaint (symptom of trouble)								
1. Engine fails to start or starts only with great difficulty	2. Engine starts but then dies	3. Uneven engine idle, idle speed incorrect	4. Poor throttle take-up	5. Engine missing under all operating conditions	6. Fuel consumption too high	7. No maximum engine power	8. CO concentration at idle too high or too low	Cause (component fault)
B 9	B 9	B 9	B 9	B 9	B 9	B 9	B 9	Universal test adapter
D14	D14	D14	D14	D14	D14	D14	D14	Fuel pressure test: Relay set defective, fuel pump not operating, pressure regulator or pump contact defective.
E13	E23		G11					Auxiliary-air device not opening
		F17						Auxiliary-air device not closing
E17	F 3	F21	G11	H 7	J 1	J13	J21	Air-flow sensor defective, potentiometer test
	F 3			H 9				Pump contact in air-flow sensor defective

Continued on B 7/B 8

Customer complaints (Fault symptoms)

1. Engine fails to start or starts only with great difficulty	2. Engine starts but then dies	3. Uneven engine idle, idle speed incorrect	4. Poor throttle take-up	5. Engine missing under all operating conditions	6. Fuel consumption too high	7. No maximum engine power	8. CO concentration at idle too high or too low	Cause (Component fault)
E 3		F13						Thermo-time switch defective (only on 1.9 l engine)
E19	F 7	F23	G15			J15	K 1	Air-intake system leaking
		F17	G 9		H23	J 9		Injection valves defective; connect test lead
E 7								Start valve not opening (only on 1.9 l engine)
E11	F 1	F15			H19		J23	Start valve leaking (only on 1.9 l engine)
				H 5				Voltage peaks; connect test lead
				H11		J11		Fuel delivery too low
E15			G 7		H21		J23	Temperature sensor II in engine defective
		F11	G17					Throttle valve not closing
						J11		Throttle valve not opening fully
E19	F 7	F23	G15	H 3		J15		Poor central ground, loose contacts, faulty plug-in connections
		F23	G15	H 3				Open circuit in wiring harness and plug-in connections, interference
						J11		Throttle-valve switch defective
		F11	G17	H13	J 3		J19	CO exhaust-gas setting too rich, idle adustment, solenoid-operated air valve
		F11	G17	H13			J19	CO exhaust-gas setting too lean, idle adjustment, burbling
				H11				Control unit defective

TEST CHART FOR UNIVERSAL TEST ADAPTER WITH CONNECTED ADAPTER LEAD (1 684 463 129)

Carefully connect universal test adapter to vehicle wiring harness. (Ignition must be off.) Testing of peripherals only.

For making measurements, connect to the universal test adapter a multimeter for voltage and resistance measurements as well as a motortester.

The individual test steps are selected by means of two program switches (one for voltage measurements, the other for resistance measurements). Each program switch has 24 positions, but only some of these are occupied for the L-Jetronic.
Be sure to follow the instructions in the test chart.
Test steps 1...10 measure voltages while starting.
Caution: Set multimeter to "voltage-measuring range"
Test steps 11...18 measure resistances.
Caution: Set multimeter to "resistance-measuring range"
For trouble-shooting, ignition "off" and remove multiple plug from adapter lead.
The following test chart contains test specifications and operating instructions for the universal test adapter.

Installation position of control unit:
The control unit is in the passenger compartment, on the front passenger side, in the footwell at the bottom right. It is secured by three screws.

Requirements for correct test procedure

1. Start testing at test step 1.

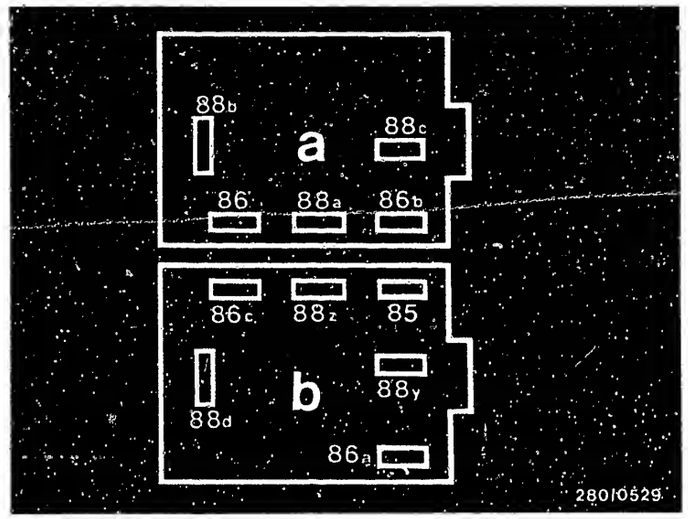
2. The order of the test steps must be kept to. The trouble-shooting instructions carry on in each case from the trouble-shooting instructions given for the previous test step.
Example:
If the ground connection term. 85 for the relay set is tested in test step 1, this test is not repeated in the following test steps.

3. If an incorrect reading is indicated for a test step, the test step in question must be repeated after the fault has been remedied.

Note:
In the following test steps a white border in the "Operation" column indicates which operation has to be changed in comparison with the preceding test step.

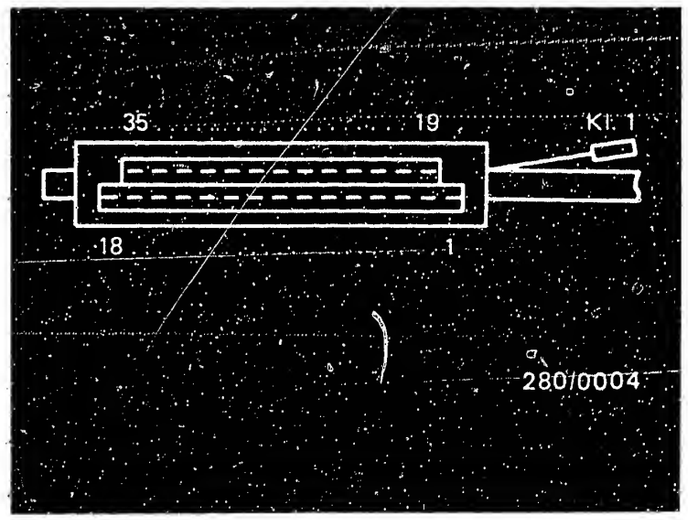
Test step 1

Operation		Reading	Testing
Program switch "V" at position:	3	Multimeter must 8 ... 15 V indicate.	Component: Relay set Starting motor term. 50
Program switch "Ω" at position:	- *		
Measuring equipment: Multimeter (Volt range)			Operation: Starting signal
Measuring range: 0...15 V			
Connection: Test sockets red (positive) and black		If reading O.K., continue testing with next test step.	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON" and start engine			



View onto connection bases
(viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

Top view of multiple plug



Trouble-shooting:

* Switch position not specified

For all voltage measurements:
1. Set value 8...15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on B 13/14

Test step 1 (continued)

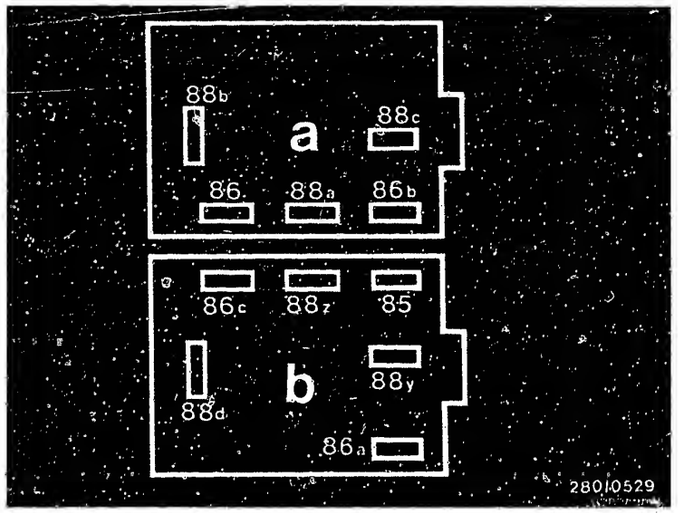
Voltage reading below 8 V:
Battery insufficiently charged or high voltage drops.

No voltage reading:
1. Voltage present at relay set term. 86a? If no voltage, check lead to starting motor term. 50 .
Test ground connection from multiple plug term. 5 to ground terminal.

2. Voltage present at relay set term. 86? If no voltage, replace relay set.

3. Test lead from relay set term. 86 to multiple plug term. 4.

Eliminate contact resistances at the plug-in connections.



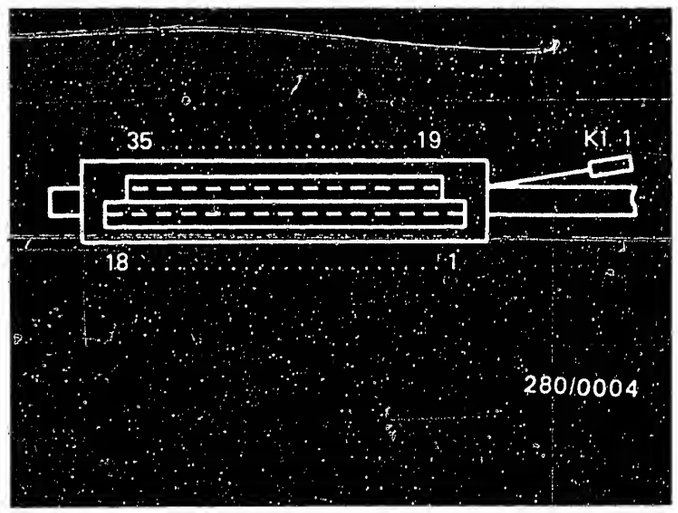
View onto connection bases
(viewed from below)
a = Jetronic wiring harness
b = Vehicle wiring harness

Installation position of components:
Relay set: On right in engine compartment on side firewall

Central ground: On intake manifold at rear, near start valve (if fitted)

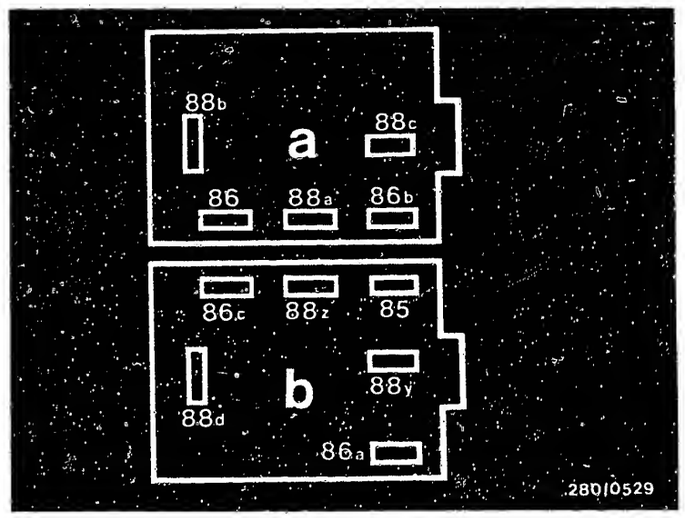
Control unit: In passenger compartment, front passenger side, in footwell at bottom right.

Top view of multiple plug



Test step 2

Operation		Reading	Testing
Program switch "V" at position:	4	Multimeter must	Component: Auxiliary-air device, Relay set
Program switch "Ω" at position:	-	8 ... 15 V	
Measuring equipment: Multimeter (Volt range)		indicate.	Operation: Voltage supply
Measuring range: 0 ... 15 V			
Connection: Test sockets red (positive) and black		If reading O.K., continue testing with next test step.	Malfunction: No reading
Operation in vehicle: Ignition "ON" and start engine			



View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

Trouble-shooting

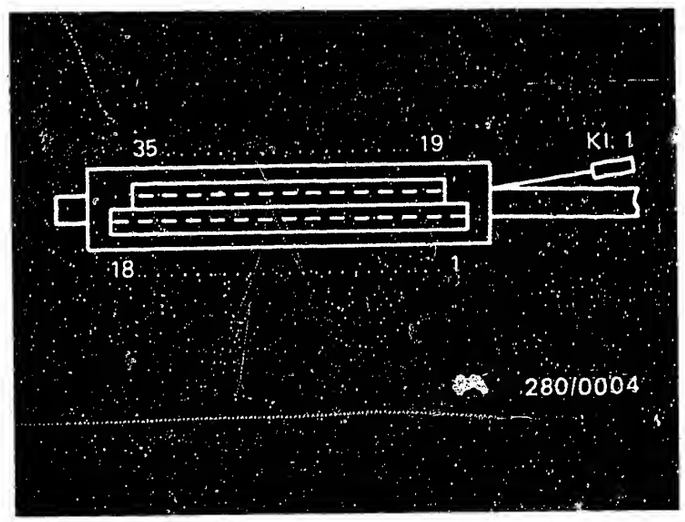
For all voltage measurements:
1. Set value 8...15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

I. Start engine, electric fuel pump operates.
1. Voltage present at relay set term. 88c? If no voltage, test lead from relay set term. 85 to central ground. If fault not remedied, replace relay set.

Continued on B17/B18

Top view of multiple plug



TEST STEP 2 (continued)

2. Voltage present at auxiliary-air device term. 4? If no voltage, test lead 48 from auxiliary-air device to relay set term. 88c.

3. Test auxiliary-air device for continuity.

Set value	
For auxiliary-air device 0 280 140 114:	40...75 Ω
For auxiliary-air device 0 280 140 104,...112,...121:	35...70 Ω

If incorrect, replace auxiliary-air device.

4. Test lead 34 from auxiliary-air device to multiple plug term. 34.

II. Start engine, electric fuel pump does not operate

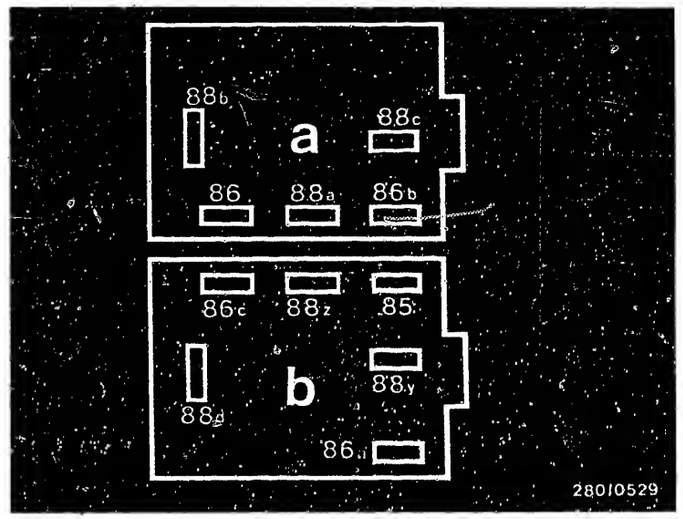
1. Voltage present at relay set term. 88y? If no voltage, test pump fuse and power supply term. 30.

2. Voltage present at relay set term. 88d? If no voltage, replace relay set.

3. Test electric fuel pump and leads (ground connection).

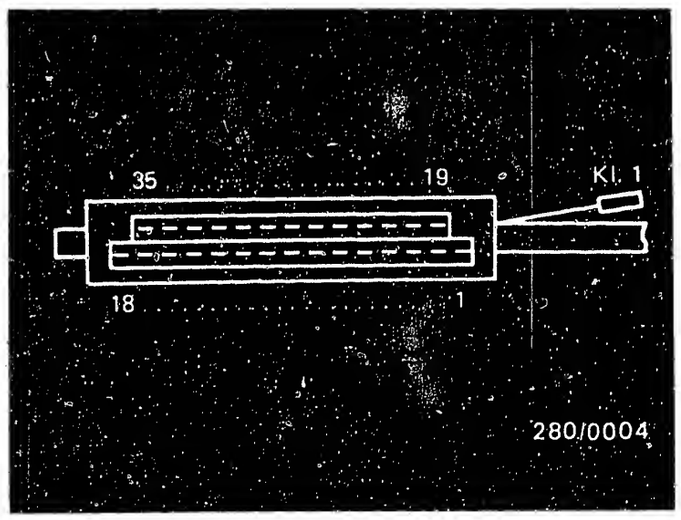
Installation position of components

Relay set:	On right in engine compartment on side firewall
Control unit:	In passenger compartment, front passenger side in footwell at bottom right
Auxiliary-air device:	At front on engine block on right
Fuel pump fuse:	Rekord: In fuse box, otherwise as "cable-to-cable" fuse near relay set
Electric fuel pump:	Manta/Ascona: On right, near rear axle Kadett: In center of luggage compartment, behind a cover Rekord: Pump in front of and filter behind rear axle on right-hand side.



View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

Top view of multiple plug



Continued on B 19/B 20

TEST STEP 2 (continued)

4. Voltage present at relay set term. 88c?
   If no voltage, test lead from relay set term. 85 to central ground.
   If fault not remedied, replace relay set.

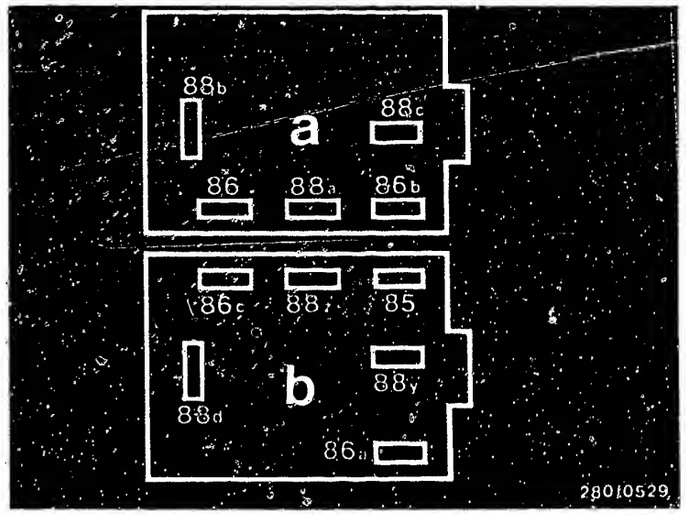
5. Voltage present at auxiliary-air device term. 48?
   If no voltage, test lead 48 from auxiliary-air device to relay set term. 88c.

6. Test auxiliary-air device for continuity.

   Set value
   For auxiliary-air device 0 280 140 114: 40...75 Ω
   For auxiliary-air device 0 280 140 104,...112,...121: 35...70 Ω
   If incorrect, replace auxiliary-air device.

7. Test lead 34 from auxiliary-air device to multiple plug term. 34

Eliminate contact resistances at the plug-in connections.



View onto connection bases
(viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

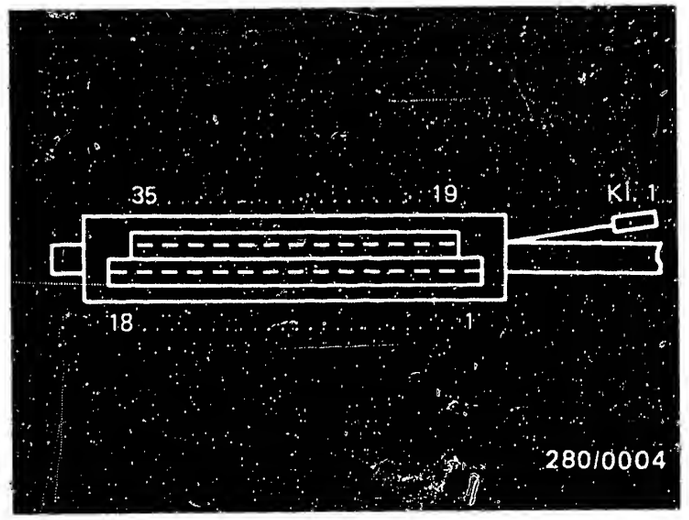
Top view of multiple plug

Installation position of components

Relay set: On right in engine compartment on side firewall

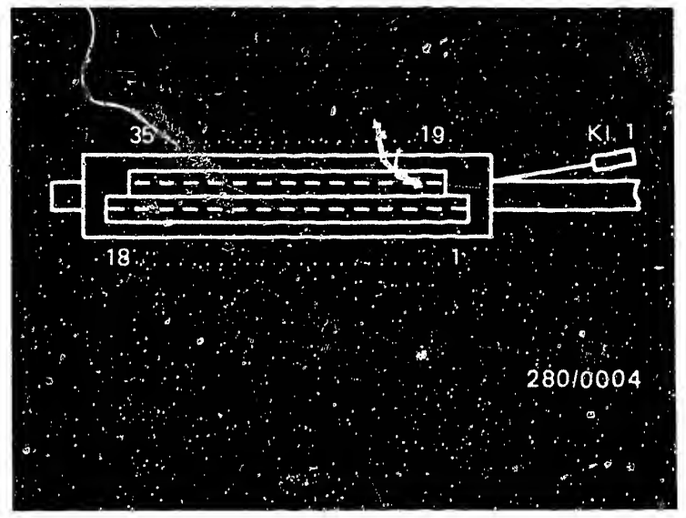
Control unit: In passenger compartment, on front passenger side, in footwell at bottom right

Auxiliary-air device: At front on engine block on right.



Test step 3

Operation		Reading	Testing
Program switch "V" at position:	5	Ignition oscilloscope must indicate ignition pulses	Component: Signal from term. 1
Program switch "Ω" at position:	-		
Measuring equipment: Motortester			Operation: Triggering of control unit by the ignition
Measuring range: Special input. Control stick as far as it will go to the left and measuring range 20 V			
Connection: Test wells		If reading O.K., continue testing with next test step.	Malfunction: No reading
Operation in vehicle: Ignition "ON" and start engine			



Trouble-shooting:

For all voltage measurements:
1. Set value 8...15 V (starting)
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on B 23

Test step 3 (continued)

Lead from multiple plug term. 1 to ignition coil term. 1 dropped off? → Test and, if necessary, repair.

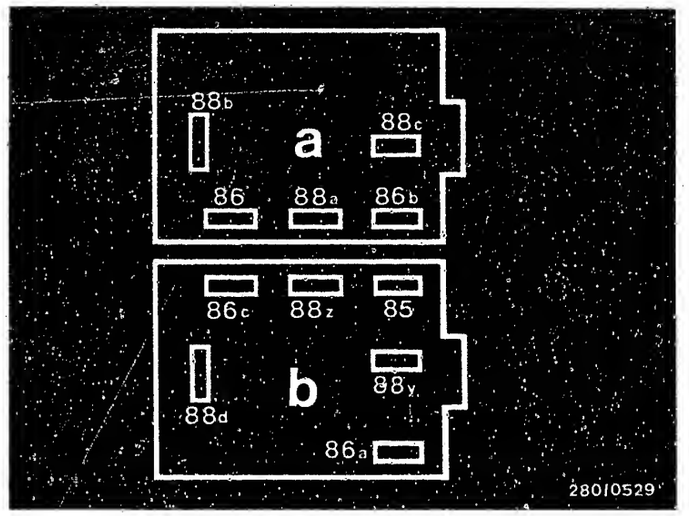
Voltage present at term. 1 ignition coil?
If not, check ignition system. If voltage present, test lead 1 for continuity and for short circuit to ground.
If the lead is O.K., then the trigger stage in the control unit has failed. Replace control unit.

Installation position of components:

Control unit:	In passenger compartment, front passenger side, in footwell at bottom right.
Central ground:	On intake manifold at rear, near start valve (if fitted).

Test step 4

Operation		Reading	Testing
Program switch "V" at position:	6	Multimeter must 8 ... 15 V indicate.	Component: Relay set Voltage supply
Program switch "Ω" at position:	-		
Measuring equipment: Multimeter (Volt range)			Operation: Voltage supply
Measuring range: 0 ... 15 V			
Connection: Test sockets red (positive) and black		If reading O.K., continue testing with next test step.	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"			



View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

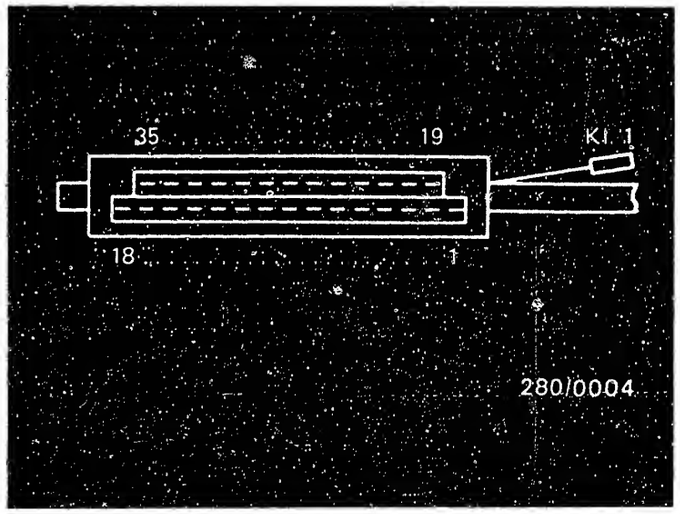
Trouble-shooting:

For all voltage measurements:
1. Set value 8...15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on C 3

Top view of multiple plug



Test step 4 (continued)

Trouble-shooting

1. Voltage at relay set term. 86c? If not, check lead term. 15.

2. Voltage at relay set term. 88z? If not, test lead to battery (positive connection).

3. Voltage at relay set term. 88a? If not, replace relay set.

4. Test lead 10 from relay set term. 88a to multiple plug term. 10 for continuity.

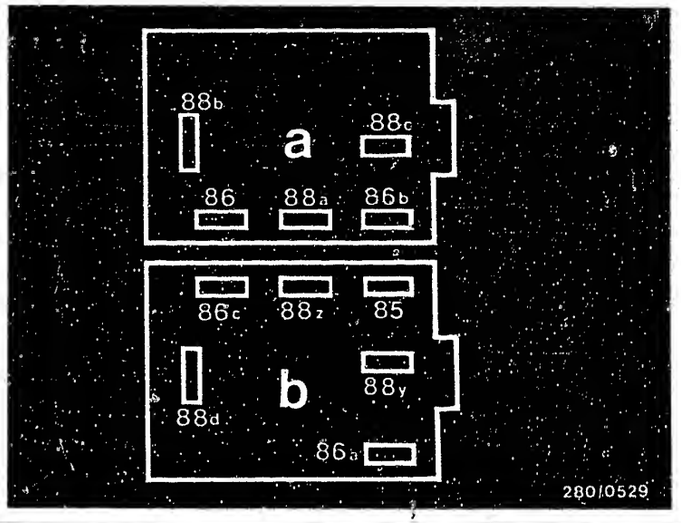
Eliminate contact resistances at the plug-in connections.

Installation position of components:

Relay set:	On right in engine compartment on side firewall
Control unit:	In passenger compartment, on front passenger side, in footwell at bottom right.

Test step 5

Operation		Reading	Testing
Program switch "V" at position:	7	Multimeter must 8 ... 15 V indicate.	Component: Control unit Relay set
Program switch "Ω" at position:	-		
Measuring equipment: Multimeter (Volt range)			Operation: Voltage supply of 1st solenoid-operated injection valve
Measuring range: 0 ... 15 V			
Connection: Test sockets red (positive) and black		If reading O.K., continue testing with next test step.	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"			



View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

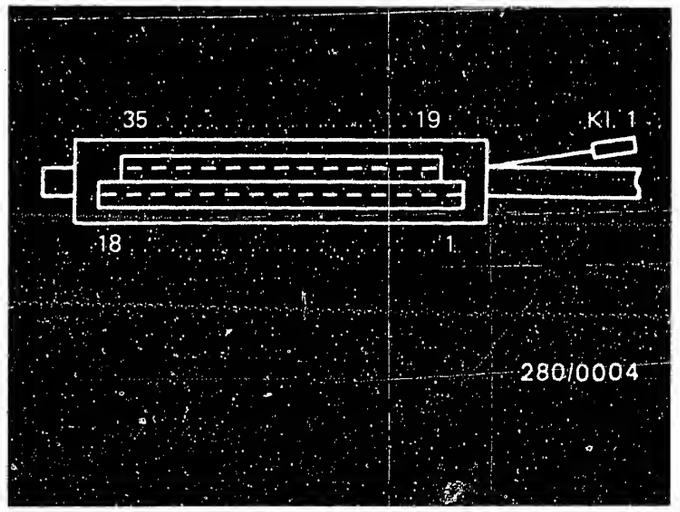
Trouble-shooting:

For all voltage measurements:
1. Set value 8 ... 15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on C 6

Top view of multiple plug



TEST STEP 5 (continued)

Trouble-shooting

1. Voltage at relay set term. 88 b? If not, replace relay set.

2. Test plug-in connection, connecting leads and series. resistors.
Set value of a series resistor: 5...7 Ω
If incorrect, replace plug connector or series resistor.

3. Test plug connector on injection valve 1. If defective, repair plug connector.

4. Voltage at injection valve connector term. 37? If not, test lead from injection valve connector to series resistor.

5. Test for continuity in lead 15 from injection valve connector to multiple plug term. 15.

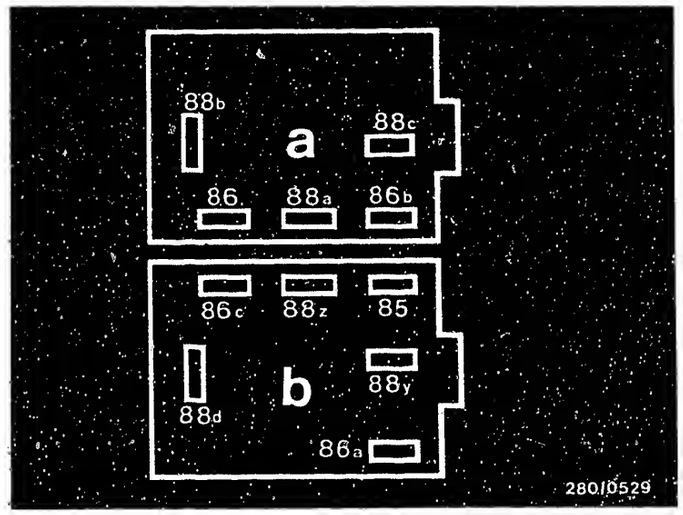
Eliminate contact resistances at the plug-in connections.

Installation position of components:

Relay set:	On right in engine compartment on side firewall.
Control unit:	On front passenger side, in foot-well at bottom right.
Injection valve:	Between engine and intake manifold.

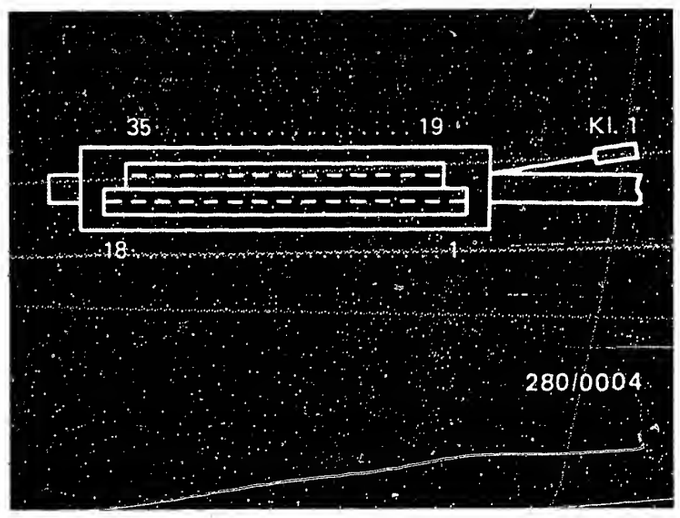
Test step 6

Operation		Reading	Testing
Program switch "V" at position:	8	Multimeter must 8 ... 15 V indicate.	Component: Control unit Relay set
Program switch "Ω" at position:	-		
Measuring equipment: Multimeter (Volt range)			Operation: Voltage supply of 2nd solenoid-operated injection valve
Measuring range: 0 ... 15 V			
Connection: Test sockets red (positive) and black		If reading O.K., continue testing with next test step.	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"			



View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

Top view of multiple plug



Trouble-shooting:

For all voltage measurements:
1. Set value 8...15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on C 9

TEST STEP 6 (continued)

Trouble-shooting

1. Voltage at relay set term. 88 b? If not, replace relay set.

2. Test plug-in connection, connecting leads and series resistors.
Set value of a series resistor: 5...7 Ω
If incorrect, replace plug connector or series resistor.

3. Test plug connector on injection valve 2. If defective, repair plug connector.

4. Voltage at injection valve connector term.38 ? If not, test lead from injection valve connector to series resistor.

5. Test for continuity in lead 33 from injection valve connector to multiple plug term. 33 .

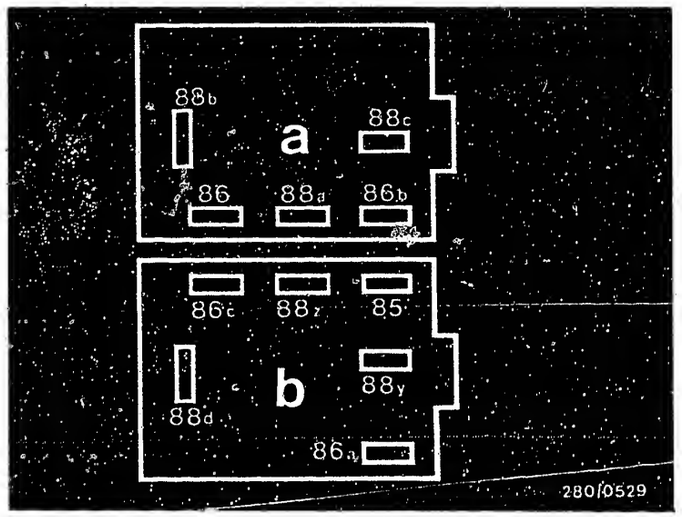
Eliminate contact resistances at the plug-in connections.

Installation position of components:

Relay set:	On right in engine compartment on side firewall.
Control unit:	On front passenger side, in foot-well at bottom right.
Injection valve:	Between engine and intake manifold.

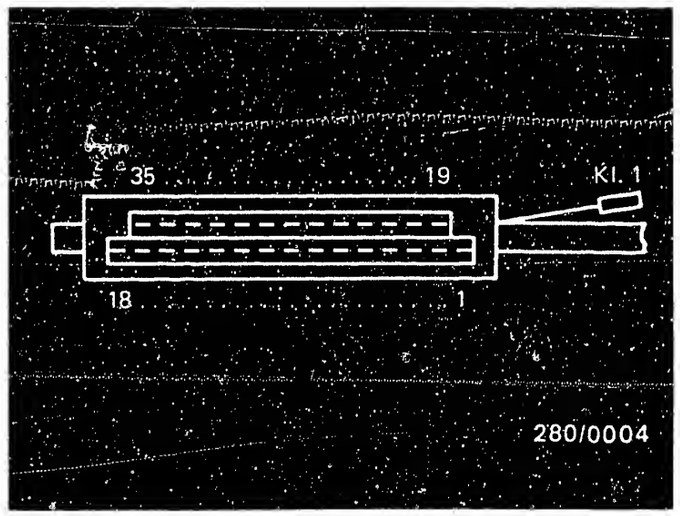
Test step 7

Operation		Reading	Testing
Program switch "V" at position:	9	Multimeter must	Component: Control unit Relay set
Program switch "Ω" at position:	-	8 ... 15 V indicate.	
Measuring equipment: Multimeter (Volt range)			Operation: Voltage supply of 3rd solenoid-operated injection valve
Measuring range: 0 ... 15 V			
Connection: Test sockets red (positive) and black		If reading O.K., continue testing with next test step.	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"			



View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

Top view of multiple plug



Trouble-shooting:

For all voltage measurements:
1. Set value 8...15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on C 12

TEST STEP 7 (continued)

Trouble-shooting

1. Voltage at relay set term. 88 b? If not, replace relay set.

2. Test plug-in connection, connecting leads and series resistors.
Set value of a series resistor: 5...7 Ω
If incorrect, replace plug connector or series resistor.

3. Test plug connector on injection valve 3. If defective, repair plug connector.

4. Voltage at injection valve connector term.40 ? If not, test lead from injection valve connector to series resistor.

5. Test for continuity in lead 32 from injection valve connector to multiple plug term. 32 .

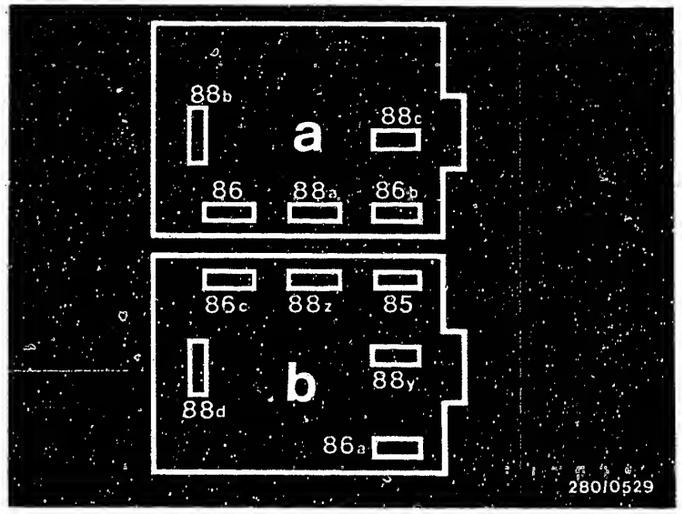
Eliminate contact resistances at the plug-in connections.

Installation position of components:

Relay set:	On right in engine compartment on side firewall.
Control unit:	On front passenger side, in foot-well at bottom right.
Injection valve:	Between engine and intake manifold.

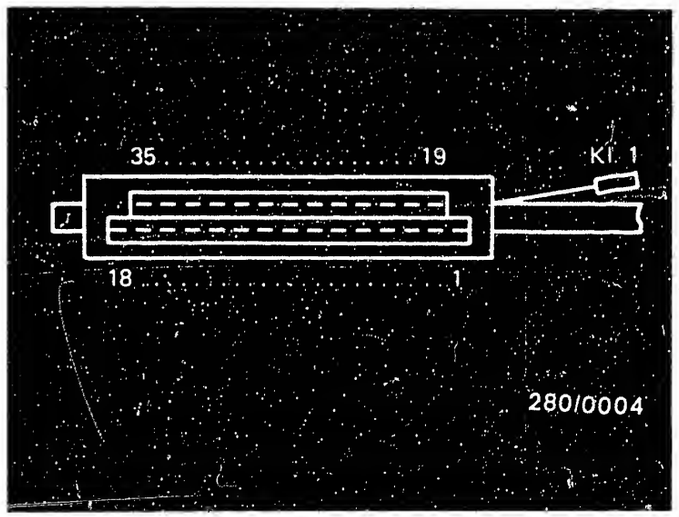
Test step 8

Operation		Reading	Testing
Program switch "V" at position:	10	Multimeter must 8 ... 15 V indicate.	Component: Control unit Relay set
Program switch "Ω" at position:	–		
Measuring equipment: Multimeter (Volt range)			Operation: Voltage supply of 4th solenoid-operated injection valve
Measuring range: 0 ... 15 V			
Connection: Test sockets red (positive) and black		If reading O.K., continue testing with next test step.	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"			



View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

Top view of multiple plug



Trouble-shooting:

For all voltage measurements:
1. Set value 8...15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on C 15

TEST STEP 8 (continued)

Trouble-shooting

1. Voltage at relay set term. 88 b? If not, replace relay set.

2. Test plug-in connection, connecting leads and series. resistors.
Set value of a series resistor: 5...7 Ω
If incorrect, replace plug connector or series resistor.

3. Test plug connector on injection valve 4 . If defective, repair plug connector.

4. Voltage at injection valve connector term. 41 ? If not, test lead from injection valve connector to series resistor.

5. Test for continuity in lead 14 from injection valve connector to multiple plug term. 14 .

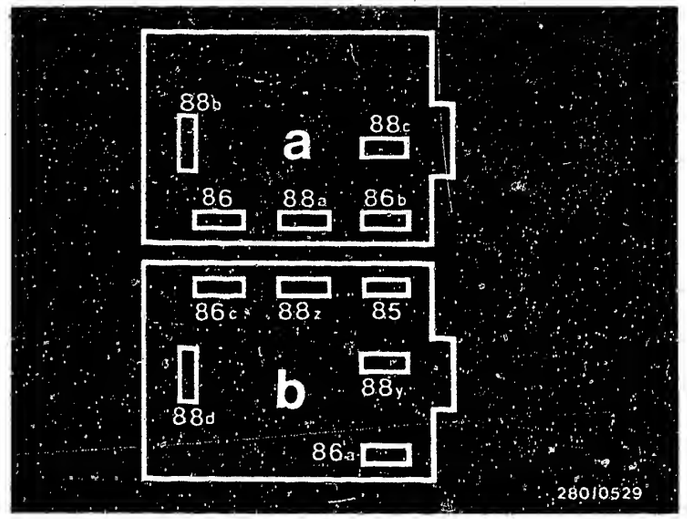
Eliminate contact resistances at the plug-in connections.

Installation position of components:

Relay set:	On right in engine compartment on side firewall.
Control unit:	On front passenger side, in foot-well at bottom right.
Injection valve:	Between engine and intake manifold.

Test step 9

Operation		Reading	Testing
Program switch "V" at position:	11	Multimeter must 8 ... 15 V indicate.	Component: Pump contact in air-flow sensor Relay set
Program switch "Ω" at position:	-		
Measuring equipment: Multimeter (Volt range)			
Measuring range: 0...15 V			Operation: Voltage supply for electric fuel pump
Connection: Test sockets red (positive) and black			
Operation in vehicle: Ignition "ON" Deflect air-flow sensor flap.		If reading O.K., continue testing with next test step.	Malfunction: No voltage reading



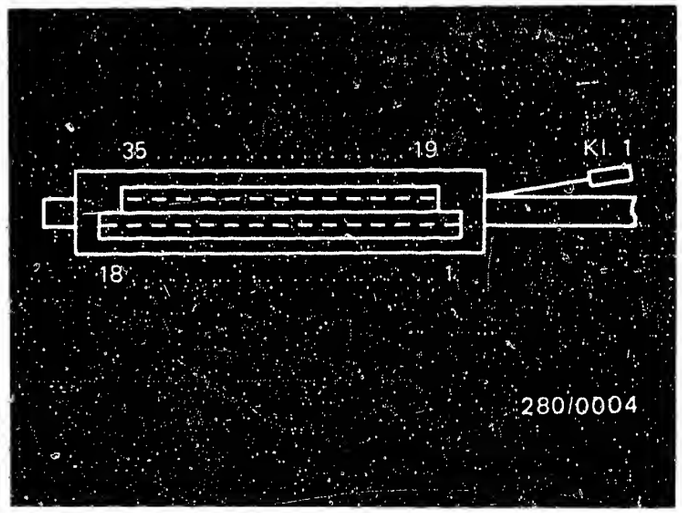
View onto connection bases (viewed from below)
Relay set
a = Jetronic wiring harness
b = Vehicle wiring harness

Trouble-shooting:

For all voltage measurements:
1. Set value 8...15 V (starting).
2. Make measurement at the respective component connector.
3. The connector remains plugged onto the relay set.

For resistance measurements:
For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary. Set value approx. 0Ω.
Important! Ignition "OFF" and ensure that good electrical contact is made when measuring.

Continued on C 18



Top view of multiple plug

Test step 9 (continued)

Trouble-shooting

1: Voltage at air-flow sensor term. 39? If not, remove plug from air-flow sensor and test lead 39.

2. Test pump contact in air-flow sensor (deflect air-flow sensor flap). Test diode (as of FD 052) in air-flow sensor between term. 6 and term. 36 (positive pole of ohmmeter to term. 6 of air-flow sensor).
Set value: approx. 0 Ω (with reversed polarity ∞Ω).

3. Test lead 36 between air-flow sensor and relay set.

4. Test lead 20 between control unit and relay set.

Eliminate contact resistances at the plug-in connections.

Installation position of components

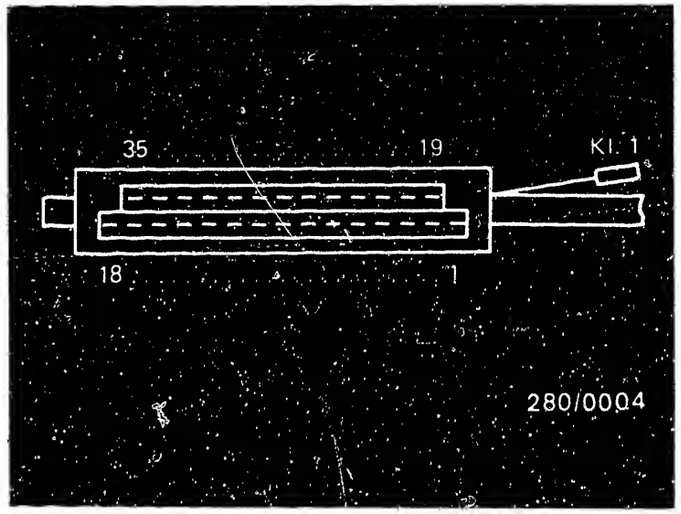
Control unit:
On driver's side, left of steering column

Air-flow sensor:
Between air filter and intake manifold

Relay set:
On right-hand side on firewall

Test step 10

Operation	Reading	Testing
Program switch "Ṽ" at position: ⬇	Multimeter must indicate 40...300 Ω for air-flow sensor 0 280 200 003,... 0 280 202 006, 0 280 202 009 and 80...600 Ω for air-flow sensor 0 280 202 006 (as of FD 141). If reading O.K., continue testing with next test step.	Component: Air-flow sensor (Potentiometer) Operation: Resistance between air-flow sensor term. 7 and ground terminal Malfunction: Resistance outside tolerance
Program switch "Ω" at position: 6		
Measuring equipment: Multimeter (Ω range)		
Measuring range: x 10 Ω		
Connection: Test sockets blue		
Operation in vehicle: Deflect air-flow sensor flap as far as it will go.		



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.

Using ohmmeter, test the following leads for continuity (set value approx. 0Ω):

- From multiple plug term. 7 to air-flow sensor term. 7
- From air-flow sensor term. 6 to multiple plug term. 6
- From multiple plug term. 5 to central ground.

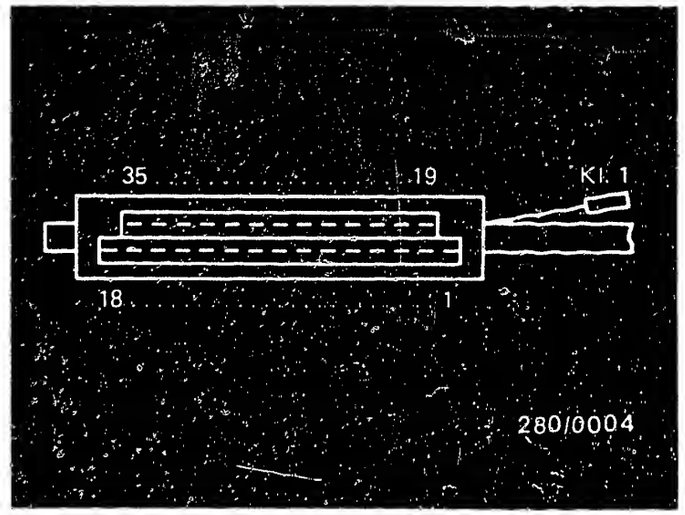
Eliminate contact resistances in the plug-in connections.

Installtion position of components:

Air-flow sensor: On right between air filter and intake manifold
Central ground: On intake manifold at rear, near start valve and fire-wall
Relay set: On right on side fire-wall
Control unit: On front passenger side, in footwell at bottom right.

Test step 11

Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must indicate 130...260 Ω for air-flow sensor 0 280 200 003, 0 280 202 006, 0 280 202 009 and 260...520 Ω for air-flow sensor 0 280 202 006 (as of FD 141). If reading O.K., continue testing with next test step.	Component: Air-flow sensor
Program switch "Ω" at position:	7		
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between air-flow sensor term. 8 and ground terminal
Measuring range: x 10 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle: ———			



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.
Using ohmmeter, test the following leads for continuity (set value approx. 0 Ω):

Air-flow sensor
- From multiple plug term. 8 to air-flow sensor term. 8
- From air-flow sensor term. 6 to multiple plug term. 6
- From multiple plug term. 5 to central ground.

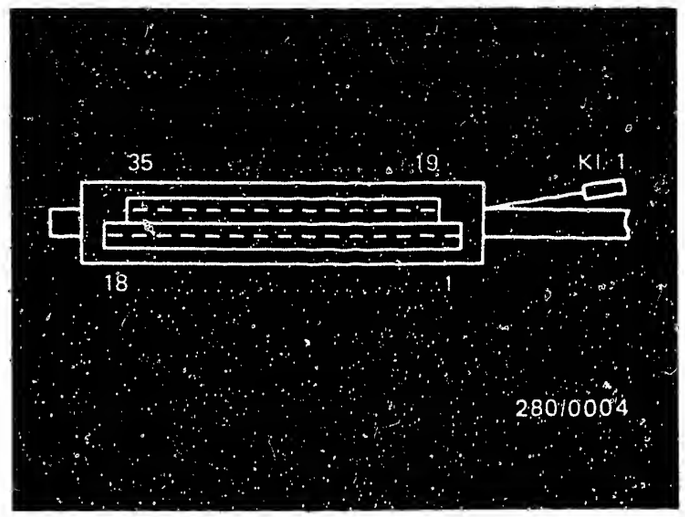
Eliminate contact resistances in the plug-in connections.

Installation position of components

Control unit: On front passenger side, in footwell at bottom right
Air-flow sensor: On right between air filter and intake manifold
Central ground: On intake manifold at rear, near start valve and firewall.

Test step 12

Operation:		Reading	Testing
Program switch "V" at position:	⬇	Multimeter must indicate 200...400Ω for air-flow sensor 0 280 200 003, 0 280 202 006, 0 280 202 009 and 400...800Ω for air-flow sensor 0 280 202 006 (as of FD 141). If reading O.K., continue testing with next test step.	Component: Air-flow sensor
Program switch "Ω" at position:	8		
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between air-flow sensor term. 9 and ground terminal
Measuring range: x 10 Ω			
Connection: Test sockets blue			Malfunction: Resistance outside tolerance
Operation in vehicle: -			



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.

Using ohmmeter, test the following leads for continuity (set value approx. 0Ω):

Air-flow sensor:
- From multiple plug term. 9 to air-flow sensor term. 9
- From air-flow sensor term. 6 to multiple plug term. 6
- From multiple plug term. 5 to central ground.

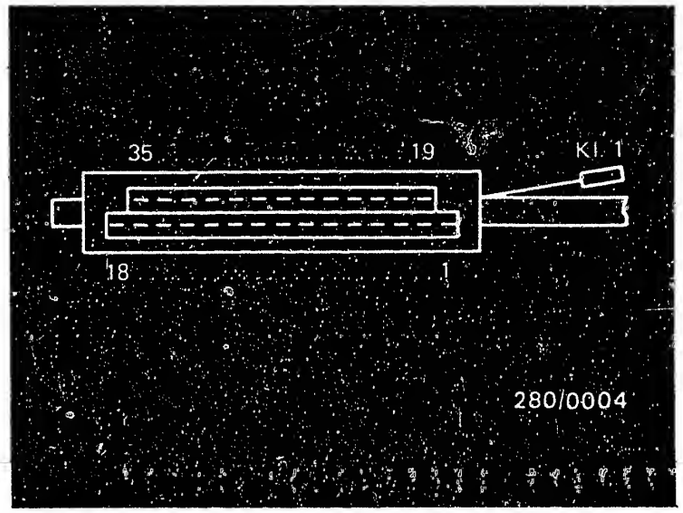
Eliminate contact resistances in the plug-in connections.

Installation position of components

Control unit: On front passenger side, in footwell at bottom right
Air-flow sensor: On right between air filter and intake manifold
Central ground: On intake manifold at rear, near start valve and firewall.

Test step 13

Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must 0...10Ω indicate	Component: Throttle-valve switch (Idle contact)
Program switch "Ω" at position:	9		
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between throttle-valve switch term. 2 and term. 18
Measuring range: x 1 Ω			
Connection: Test sockets blue		If reading O.K., continue testing with next test step.	Malfunction: Resistance outside tolerance
Operation in vehicle: Accelerator in rest position			



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.

Throttle-valve closed? Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.
Adjustment: The throttle valve must be set to just before it sticks with the throttle-valve stop screw. Straighten throttle linkage if bent. Does the throttle valve open fully? Throttle linkage, accelerator pedal O.K.? If necessary, straighten linkage. Throttle linkage may stick due to floor mat etc.
Fault still present?

Using ohmmeter, test the following leads for continuity (set value approx 0Ω):

- From multiple plug term. 2 to throttle-valve switch term. 2
- From throttle-valve switch term. 18 to multiple plug term. 18
  Eliminate contact resistances in the plug-in connections.

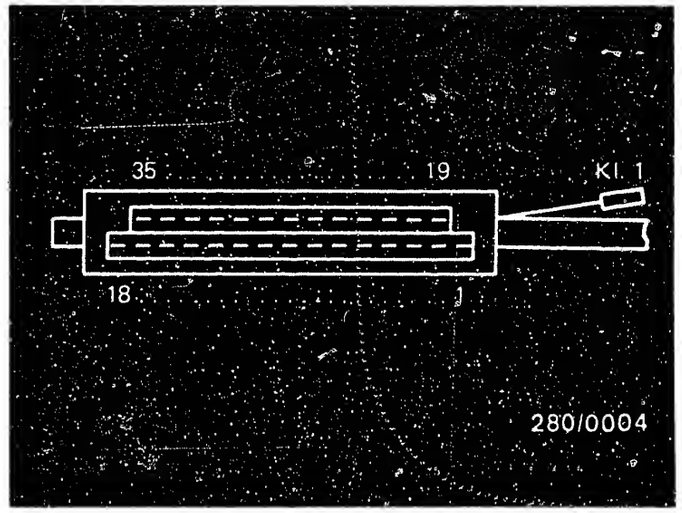
Installation position of components

Throttle-valve switch:
On intake manifold on right

Control unit:
On front passenger side, in footwell on bottom right

Test step 14

Operation	Reading	Testing
Program switch "Ω" at position: ⬇ Program switch "V" at position: 10 Measuring equipment: Multimeter (Ω range) Measuring range: x 1 Ω. Connection: Test sockets blue Operation in vehicle: Accelerator in full-load position	Multimeter must 0...10Ω indicate If reading O.K., continue testing with next test step.	Component: Throttle-valve switch (Full-load contact) Operation: Resistance between throttle-valve switch term. 3 and term. 18 Malfunction: Resistance outside tolerance



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.

Using ohmmeter, test the following leads for continuity (set value approx. 0Ω):

- From multiple plug term. 3 to throttle-valve switch term. 3
- From throttle-valve switch term. 18 to multiple plug term. 18.

Eliminate contact resistances in the plug-in connections.

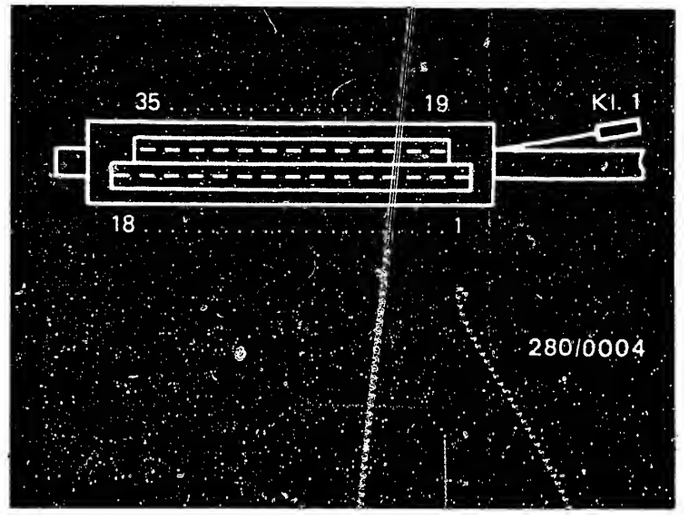
Installation position of components

Throttle-valve switch:
On intake manifold on right

Control unit:
On front passenger side, in footwell on bottom right

Test step 15 (only for 2.0 l engine)

Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must 30Ω... 30kΩ (depends on temperature) indicate.	Component: Temperature sensor I (intake air)
Program switch "Ω" at position:	11		
Measuring equipment: Multimeter (Ω range)			Operation: Resistance on air-flow sensor between term. 27 and term. 6
Measuring range: x 10 Ω or x 100 Ω			
Connection: Test sockets blue		If reading O.K., continue testing with next test step.	Malfunction: Resistance outside tolerance
Operation in vehicle:			



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.
Measure resistance directly at temperature sensor I (intake air) in air-flow sensor.
At ambient temperature (approx. 15-30° C): 1.45 ... 3.3 kΩ
Engine at normal operating temperature(approx 80° C): 280 ... 360 Ω

Using ohmmeter, test the following leads for continuity (set value approx. 0Ω):

- From multiple plug term. 27 to air-flow sensor term. 27
- From air-flow sensor term. 6 to multiple plug term. 6
- From multiple plug term. 5 to central ground.

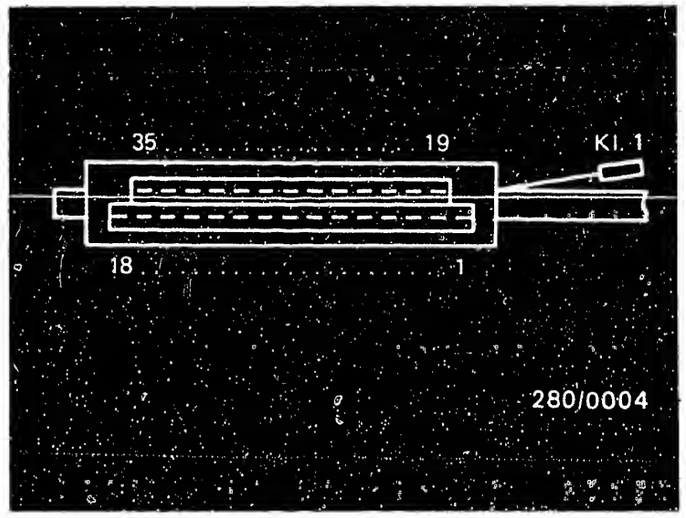
Eliminate contact resistances in the plug-in connections.

Installation position of components

Control unit: On front passenger side, in footwell at bottom right
Air-flow sensor: On right between air filter and intake manifold
Central ground: On intake manifold at rear, near start valve and firewall.

Test step 16

Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must 30 Ω... 30 kΩ (depends on temperature) indicate.	Component: Temperature sensor II (engine)
Program switch "Ω" at position:	12		
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between control unit term. 13 and central ground
Measuring range: x 10 Ω or x 100 Ω		If reading O.K., continue testing with next test step.	Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle: -			



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.

Measure resistance directly at temperature sensor II (engine).

	1.9 l engine (White plug)	2.0 l engine (blue plug)
At ambient temperature (approx. +15...+30°C).	1.3...3.6 k Ω	1.45...3.3 kΩ
With engine at op. temp. (approx. +80°C):	250...390 Ω	280...360 Ω

Test the following leads for continuity using ohmmeter (Set value approx. 0Ω)

- From multiple plug term. 13 to temperature sensor II (engine) term. 13.
- Lead 49 from temperature sensor II to central ground.

Eliminate contact resistances in the plug-in connections.

Installation position of components

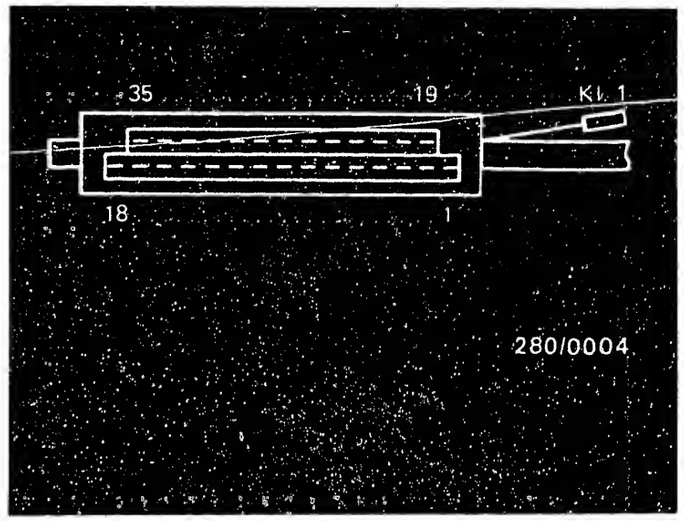
Engine temperature sensor: in cooling water system on engine block at front

Central ground: On intake manifold at rear, near start valve and fire-wall

Control unit: On front passenger side, in footwell at bottom right

Test step 17

Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must	Component: Ground connection of output stage
Program switch "Ω" at position:	13	0 ... 10Ω indicate.	
Measuring equipment: Multimeter (Ω range)			Operation: Ground connection of control unit
Measuring range: x 1Ω			
Connection: Test sockets blue		If reading O.K., continue testing with next test step.	Malfunction: Resistance outside tolerance
Operation in vehicle: -			



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.

Using ohmmeter, test the following leads for continuity (set value approx. 0Ω):

- From multiple plug term. 16 to central ground.
- From multiple plug term. 5 to central ground.

Eliminate contact resistances at the plug-in connections.

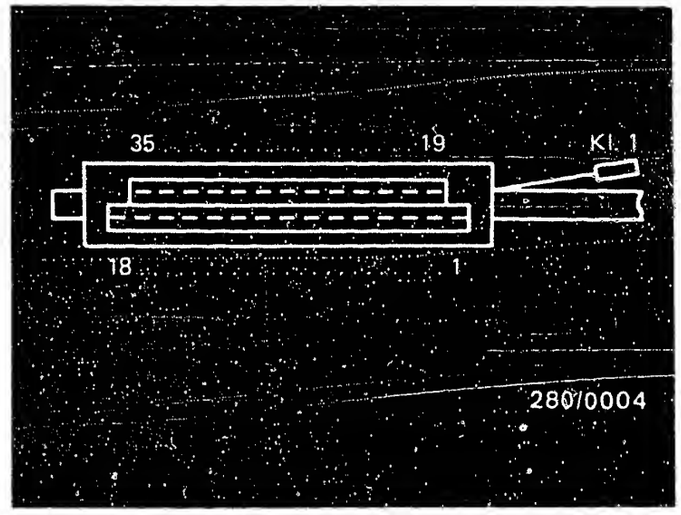
Installation position of components

Central ground: On intake manifold at rear, near start valve and firewall

Control unit: On front passenger side, in footwell at bottom right

Test step 18

Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must 0 ... 10Ω indicate	Component: Ground connection of output stage
Program switch "Ω" at position:	14		
Measuring equipment: Multimeter (Ω range)			Operation: Ground connection of control unit
Measuring range: x 1 Ω			
Connection: Test sockets blue		If reading O.K., continue testing with next test step.	Malfunction: Resistance outside tolerance
Operation in vehicle: -			



Top view of multiple plug

Trouble-shooting:

For testing, remove the wiring-harness plug from the test adaptor and use the circuit diagram if necessary.

Using ohmmeter, test the following leads for continuity (set value approx. 0Ω):

- From multiple plug term. 17 to central ground.
- From multiple plug term. 5 to central ground.

Eliminate contact resistances at the plug-in connections.

Installation position of components

Central ground: On intake manifold at rear, near start valve and firewall

Control unit: On front passenger side, in footwell at bottom right

The test with the universal test adapter is now completed. The fuel pressure test must now be performed. If a fault is found during a test, the test must be repeated after the fault has been remedied.

The fuel pressure test is described on Coordinates D 14-E 4.

Fuel pressure test

yes

Fuel pump operating?
(listen)
Relay set O.K.?

no

yes

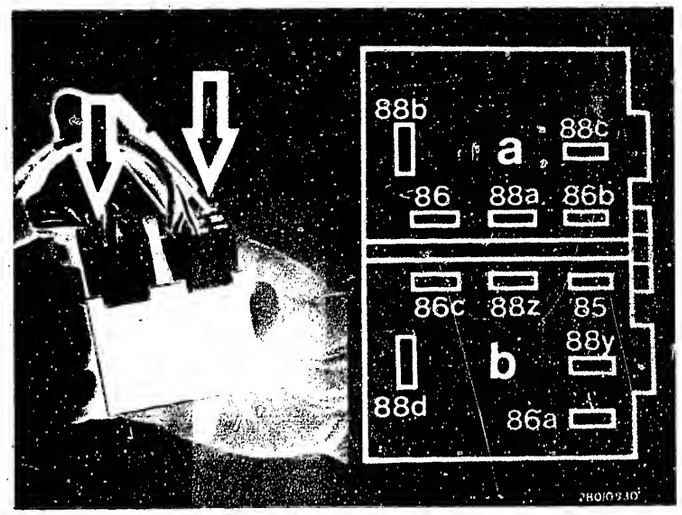
1. Test relay set

For testing, unscrew relay set and turn round so that the connection bases are accessible from below.
Test power supply.
Switch on ignition. Using voltmeter, measure battery voltage at term. 88z, 88b and 88a to vehicle ground. If no voltage present, test connecting leads.
Lead O.K.? If yes ——>

2. Test resistance at relay set between term. 86b (connection of positive pole) and term. 85.

For relay set
0 332 514 103/...109 50...110 Ω
For relay set
0 332 514 123/...124 70...500 Ω
Test specification O.K.? If yes ——>

3. Start engine, test voltage at disconnected pump plug (set value min. 12 V). If no voltage present: Test voltage at pump fuse and relay set term. 88y and 88c.
The pump fuse is near the relay set ("cable-to-cable" fuse) or, in the Rekord, in the fuse box.
Voltage at term. 88y ——> replace pump fuse.
No voltage at term. 88d ——> replace relay set.



Measure voltage on back of plug.
a = Jetronic wiring harness
b = Vehicle wiring harness

Continued on D 16/D 17

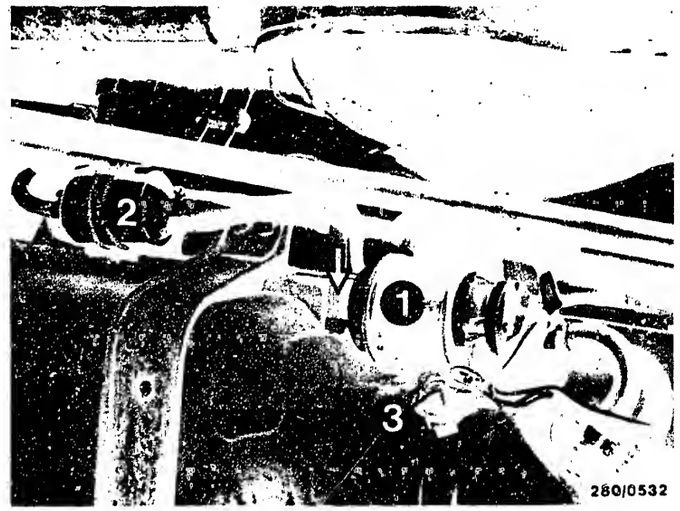
Fuel pressure test (continued)

4. Ground connection of fuel pump O.K?
If not, test ground lead for open circuit and good connection.
Ground terminal (Manta, Kadett, Ascona): Near fuel pump on body.
Rekord: in luggage compartment between the two wheel boxes, behind the rear seat panel.
Fuel pump operating?
If not ——>

5. Start engine, test voltage at disconnected pump plug
(Set value min. 12 V).
If voltage present, replace fuel pump.

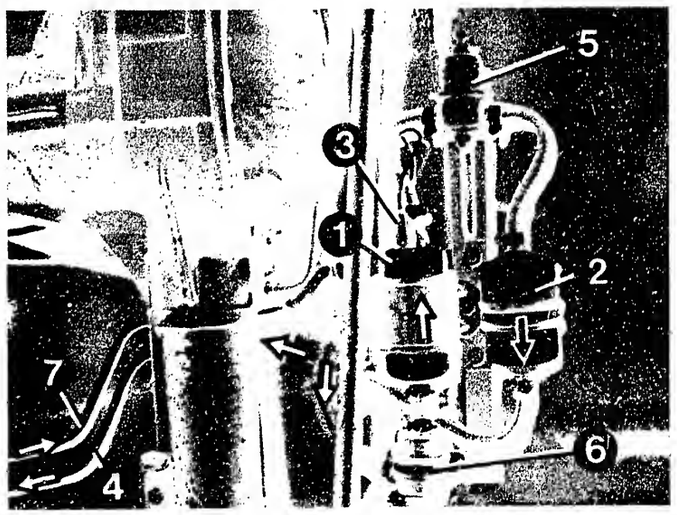
yes

Continued on D18/D19



1.9 l engine
1 = Electric fuel pump
2 = Fuel filter
3 = Pump plug
Arrows = direction of fuel flow
4 = Fuel delivery line
5 = Fuel-line-pressure damper
6 = Fuel strainer
7 = Fuel return line

2.0 l engine



Fuel pressure test (continued)

Fuel pressure O.K.?

Test specification: 2.8...3.2 bar

Test specification reached?

no

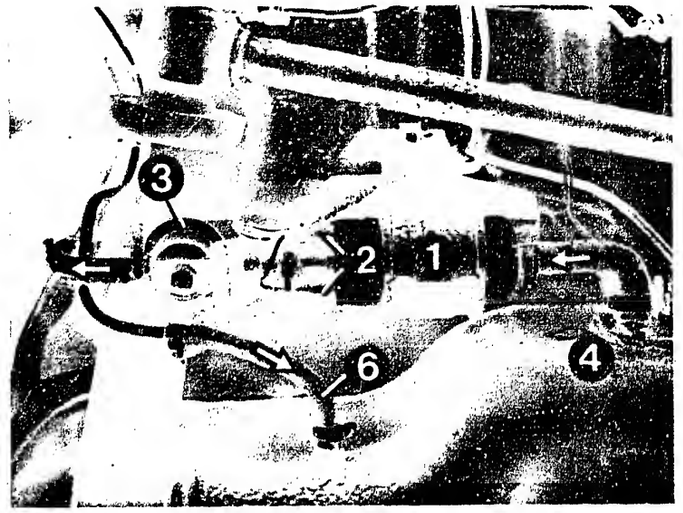
Installation position of fuel filter and electric fuel pump

2.0 l engine - Rekord:
(see pictures at top and bottom right)

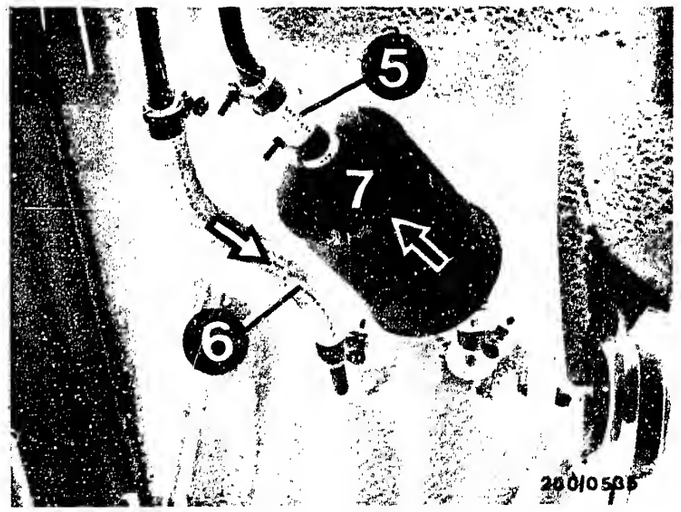
Kadett:
Electric fuel pump and fuel filter are in the luggage compartment behind a cover.

yes

Continued on D 20/D 21



2.0 l engine - Rekord
1 = Electric fuel pump
2 = Pump plug
3 = Fuel-line-pressure damper
4 = Strainer in tank
5 = Fuel delivery line
6 = Fuel return line
7 = Fuel filter
Arrows = Direction of fuel flow



Fuel pressure test (continued)

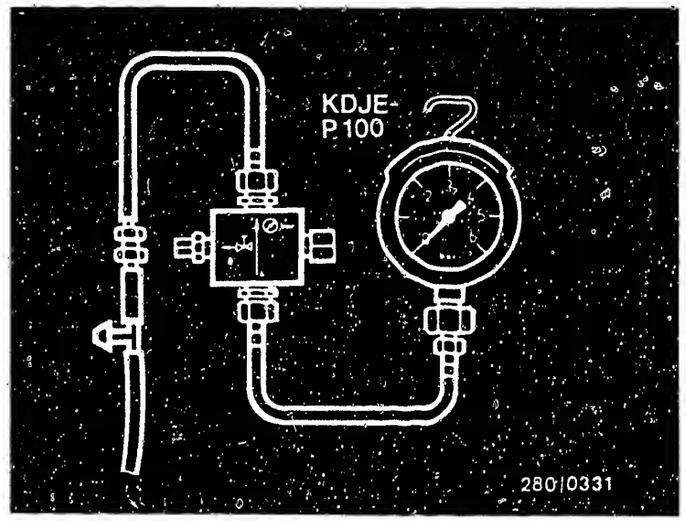
yes

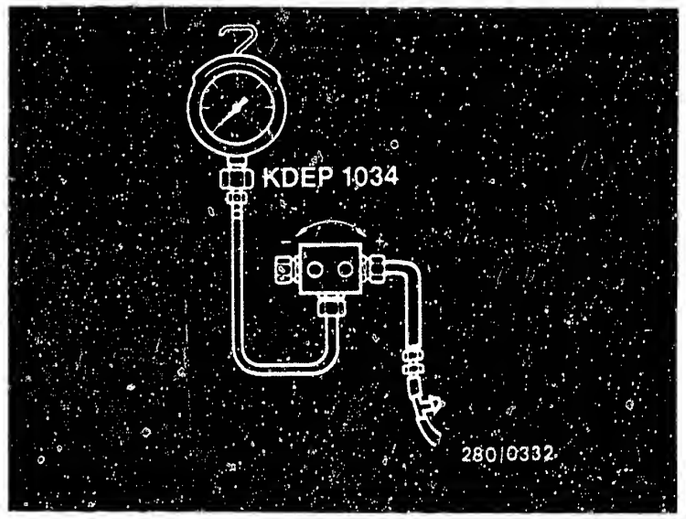
Testing:
Remove hose from fuel delivery line. Connect pressure gauge.
Caution: When removing the fuel hose, make sure that no fuel gets onto hot parts of the engine.

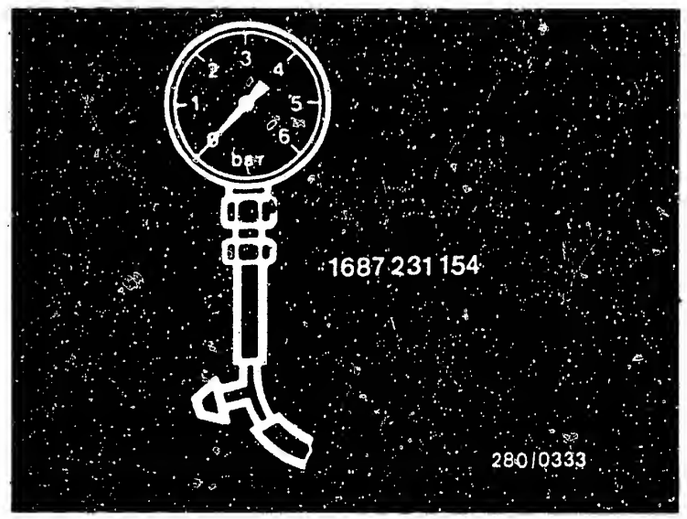
Testing the fuel pressure
Connect the connections of the pressure tester into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw.

1.9 l engine
The end of the hose is plugged onto the fuel delivery line, and the free Y-piece is plugged onto the hose to the pressure regulator.

2.0 l engine
Unscrew fuel delivery line (at wheel box junction on right-hand side).







Continued on D 22/D 23

Fuel pressure test (continued)

Plug Y-connecting piece of pressure tester onto the hose to the fuel-distribution pipe. Plug the hose of the pressure tester onto the fuel delivery line. Make sure there are no leaks. Switch on the ignition.
Remove hose between air filter and air-flow sensor. Slightly deflect air-flow sensor flap (pump contact must close).
Fuel pump must operate.

Fuel pump pressure 2.8...3.2 bar
Let engine idle - fuel pump pressure approx. 2.5 bar.

yes

Fuel pressure O.K?

Test specification

2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Testing the pressure regulator
Switch on ignition, and deflect air-flow sensor flap slightly (pump contact must close). Electric fuel pump must operate

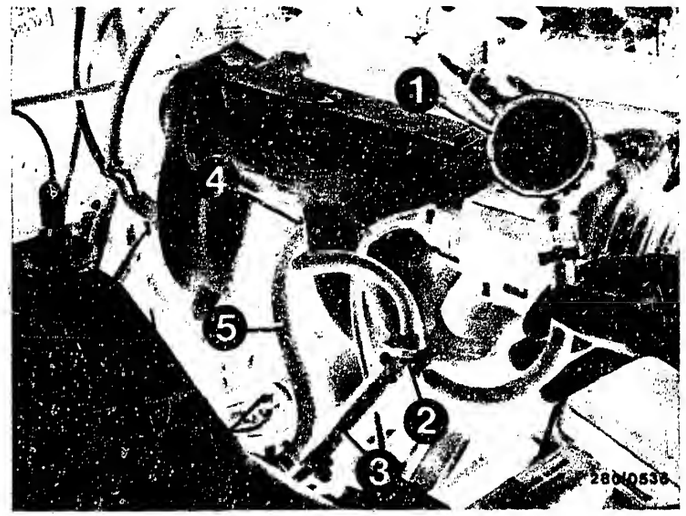
Fuel pump pressure

2.8...3.2 bar

yes

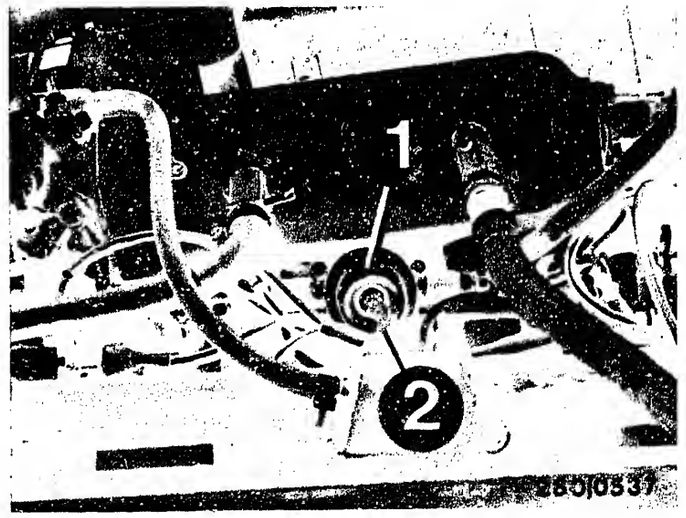
yes

Continued on E1/E2



2.0 l engine (1.9 l engine similar)
1 = Pressure gauge
2 = Y-connecting piece
3 = Fuel delivery line
4 = Pressure regulator
5 = Fuel return line

1.9 l engine (2.0 l engine similar)
1 = Pressure regulator
2 = Intake-manifold connection



Fuel pressure test (continued)

yes

Fuel pressure of 2.8 bar not reached:

1. Slowly pinch off fuel return line (caution: do not load pressure gauge above 6 bar).
Pressure rises above 4 bar ——→
Replace pressure regulator.
Pressure remains below 4 bar ——→
Replace fuel pump.

2. Test fuel delivery line and fuel filter for throughflow.

3. Strainer in tank clogged.

4. Corrosion in tank.

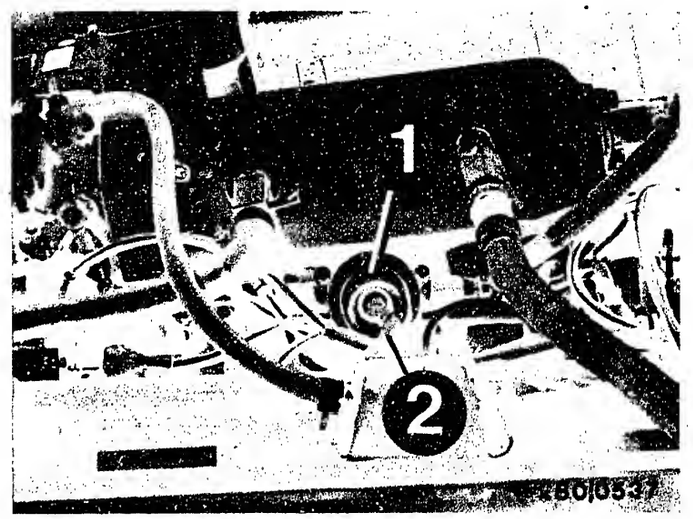
Fuel pressure of 3.2 bar exceeded:

1. Fuel return line clogged or pinched.

2. Replace pressure regulator.

Fit hose between air filter and air-flow sensor and securely tighten hose clamp (leaks).

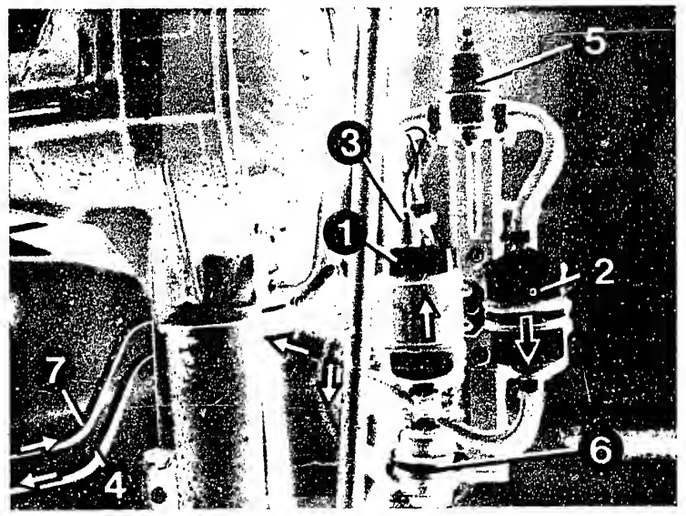
Continued on E3/E4



1.9 l engine (2.0 l engine similar)

1 = Pressure regulator
2 = Intake-manifold connection

Fuel pump installation on Manta and Ascona: (Rekord similar, Kadett: in luggage compartment, behind a cover)
1 = Electric fuel pump
2 = Fuel filter
4/7 = Fuel delivery and return lines



Fuel pressure test (continued)

Does fuel pressure remain constant after engine has started?

no

Test fuel pump contact in air-flow sensor:

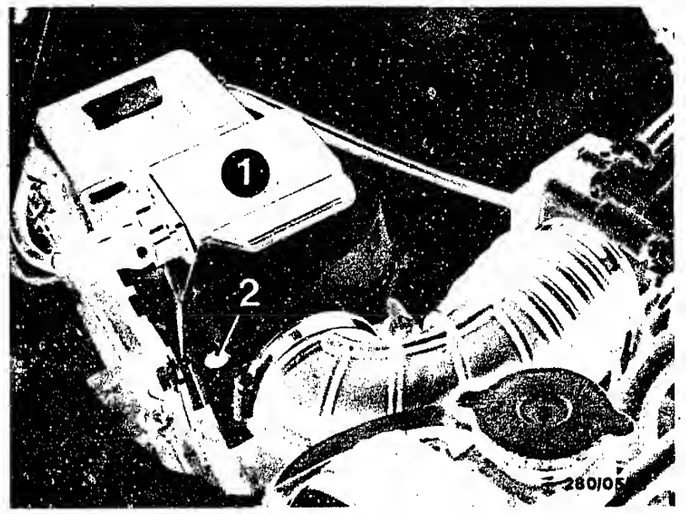
1. Standard production air-flow sensor:
Remove air hoses and connector. Connect ohmmeter to term. 36 and term. 39 of air-flow sensor. Open air-flow sensor flap slightly by hand. Reading must change from ∞Ω to 0 Ω. If not, replace air-flow sensor.
Fit hose between air filter and air-flow sensor and secure. Check for leaks.

2. Air-flow sensor as of FD 051:
Engine stopped while hot
Remove plug from air-flow sensor and connect ohmmeter to term. 6 and term. 36.
Positive pole of ohmmeter to term. 6 = approx. 0Ω.
With reversed polarity: approx. ∞Ω.
If readings incorrect ——> replace air-flow sensor.

yes

The fuel pressure test is now completed.
If the fault has not been found or if you require further information on how to remedy the fault, continue with the trouble-shooting program of your choice.

Detailed trouble-shooting ——> Coordinate B 3
Direct trouble-shooting ——> Coordinate B 5



2.0 l engine (1.9 l engine similar)

1 = Air-flow sensor
2 = Bypass screw (CO adjustment). Turning in a clockwise direction = richer mixture

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into three rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.

Starting motor operates, but engine fails to start or starts only with great difficulty.

Yes

Ignition, engine etc O.K.? — No → Remedy fault in ignition and engine

Yes

Test with universal test adapter already performed? — No → For testing see Coordinates B9...D13

Yes

Fuel pressure test performed ? — No → For testing see Coordinates D14...E4

Yes

Continued on E7/E 8

Starting motor operates, engine fails to start or starts only with great difficulty (Continued)

Start valve O.K.? (Only for 1.9 l engine)

No

Functional test: (Values in parentheses apply only to thermo-time switch 0 280 130 219)
Test power supply to start valve when starting. To do this, remove plug from start valve and connect voltmeter to term. 46 and term. 45/term. 47 of start valve plug.
Coolant at ambient temperature below +30°C (+10°C):
Voltage reading min. 6 V

Coolant temperature above +40°C (+20°C):
Voltage reading approx. 0 V

Test the following leads for continuity with ohmmeter (set value approx. 0 Ω).

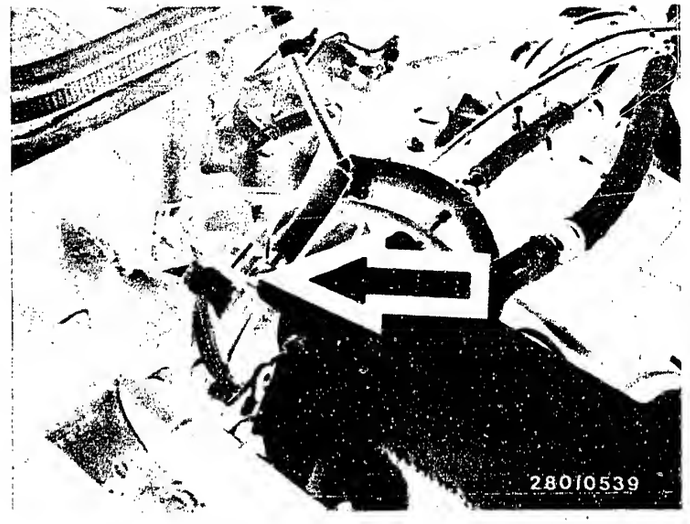
- Lead from start valve term. 46 to thermo-time switch term. W.
- Lead from start valve term. 45 to thermo-time switch term. G.
- Lead from start valve term. 47 to relay set term. 86.

Check ground connection of thermo-time switch.

Yes

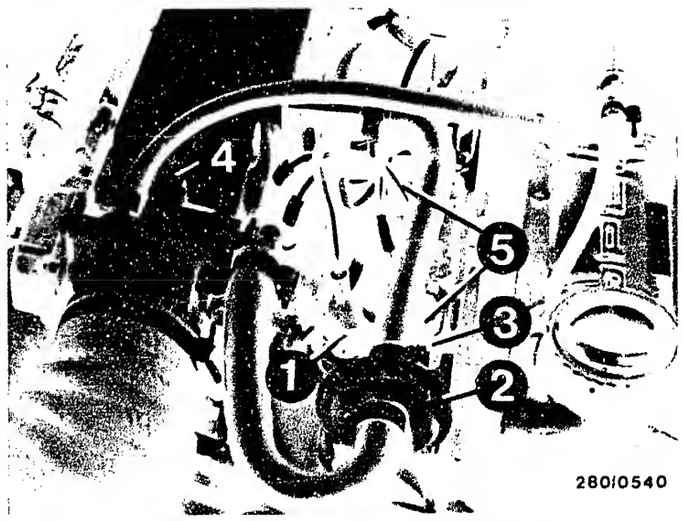
Yes

Continued on E 9/E 10



Arrow = Start valve

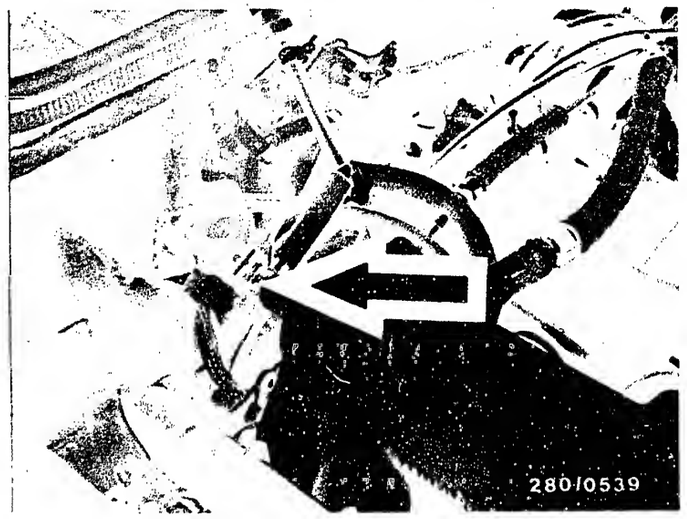
1 = Thermo-time switch



Starting motor operates, engine fails to start or starts only with great difficulty

(Continued)

Electric test of start valve:
Connect ohmmeter to start valve (remove plug):
Set value approx. 4 Ω.
Mechanical test of start valve:
Remove start valve from intake manifold and hold in a container. (Caution! Fire hazard!).
When starting at temperatures below ambient temperature (approx. + 15°...30°C) the start valve must squirt (max. 8 sec.). With the engine at normal operating temperature (approx. +80°C) the start valve must not squirt. With the ignition switched on and the pressure built up the start valve must likewise not squirt.



Arrow = Start valve

Yes

Continued on E 11/E 12

Starting motor operates, engine fails to start or starts only with great difficulty. (Continued)

Yes

Carry out squirt test for engine at normal operating temperature (approx. +80°C) as follows: Remove plug from thermo-time switch and ground term. W.

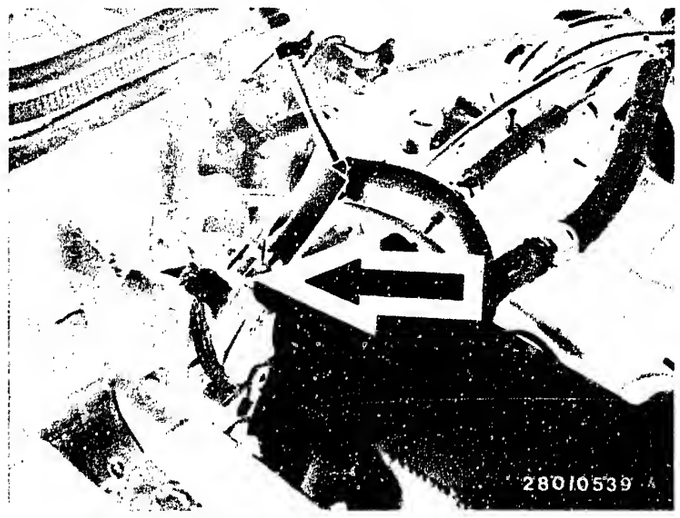
Testing the start valve for leaks:

1. When installed
Pinch off the fuel delivery line to the start valve. If engine then runs smoothly, replace start valve.

2. When removed
Remove start valve (Caution! Fire hazard!). Fuel line and electric lead remain connected (place collector vessel under the start valve). Build up fuel pressure (remove hose between air filter and air-flow sensor. Ignition "ON" and deflect air-flow sensor flap).

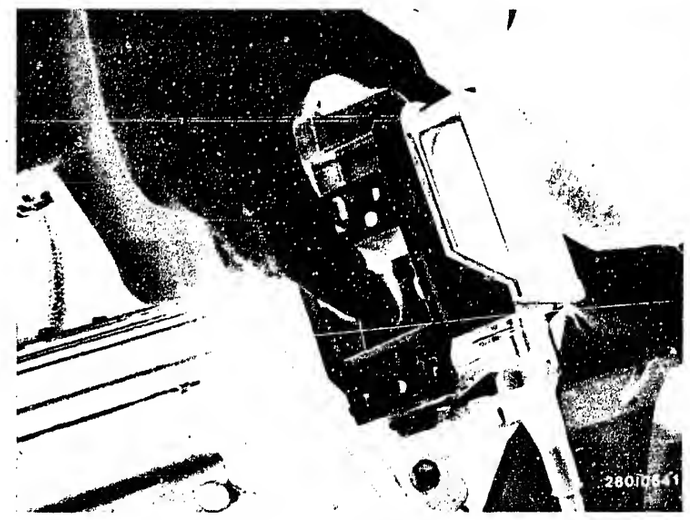
Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

Caution!
After the test is completed, the hose between air filter and air-flow sensor must be fitted again. Make sure the hose clamp is tight.



Arrow = Start valve

Opening the air-flow sensor flap



Continued on E13/E14

Starting motor operates, engine fails to start or starts only with great difficulty. (Continued)

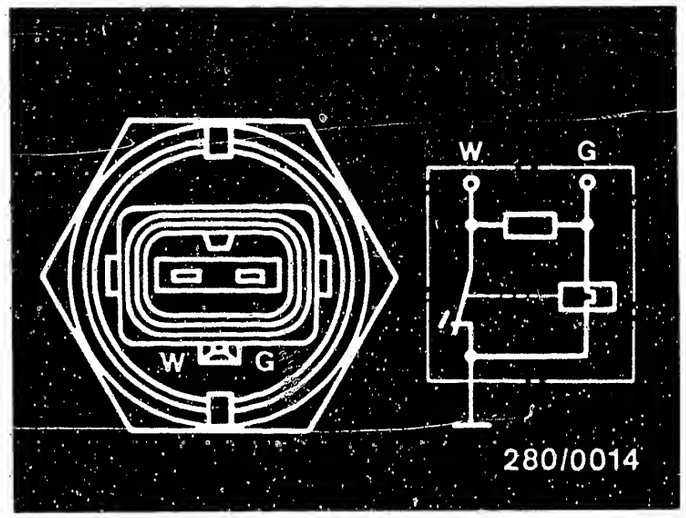
Thermo-time switch O.K.? (only for 1.9 l engine)

No

Electrical test

Test thermo-time switch 35°/8 sec. as follows: Remove plug and make direct resistance measurement at thermo-time switch using ohmmeter.

	Between term. "G" + ground	Between term. "W" + ground	Between term. "G"+ "W"
Ambient temperature (below 30°C)	25...40 Ω	0 Ω	25...40 Ω
Engine at normal operating temperature (above 40°C)	50...80 Ω	100...160 Ω	50...80 Ω



Yes

Auxiliary-air device tested? (Mechanically O.K.?)

No

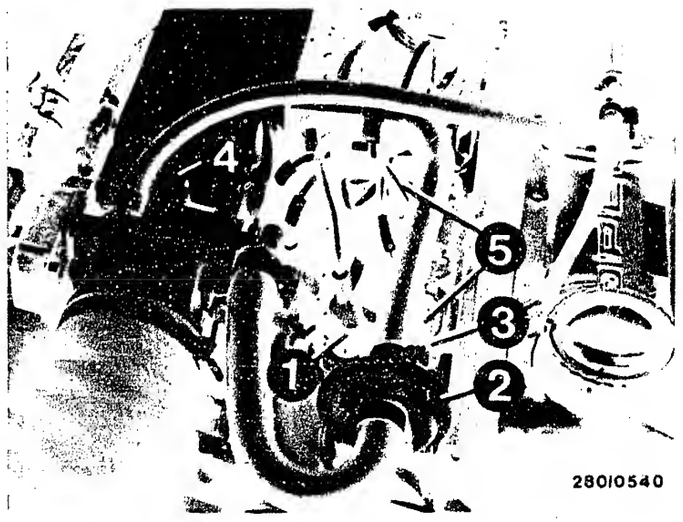
Testing:

1. Visual examination of auxiliary-air device:
When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device. (Remove hoses and look down, possibly using a small mirror).
2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

Yes

Continued on E15/E16

2=Auxiliary-air device
3=Temperature sensor II (engine)



Starting motor operates, engine fails to start or starts only with great difficulty. (Continued)

Temperature sensors tested? — No →

Yes

Testing:

Temperature sensor I measures the intake air temperature and is located in the air duct of the air-flow sensor. Measure the following values between term. 27 and term. 6 of air-flow sensor:

At ambient temperature (approx. 15...30°C):	1.45...3.3 kΩ
With engine at normal operating temperature (approx. 80°C):	280...360 Ω

Make direct resistance measurement at temperature sensor II (engine) using ohmmeter. Resistance measurement at term. 13 and term. 49 (ground):

At ambient temperature (approx. 15...30°C):	1.3...3.6 kΩ 1.45...3.3 kΩ[1])
With engine at normal operating temperature (approx. 80C):	250 ...390Ω (280...360Ω)[1])

If incorrect, test the following leads for open circuit or short circuit using ohmmeter:

Temperature sensor I:

- From multiple plug term. 27 to air-flow sensor term. 27.
- From air-flow sensor term. 6 to multiple plug term. 6

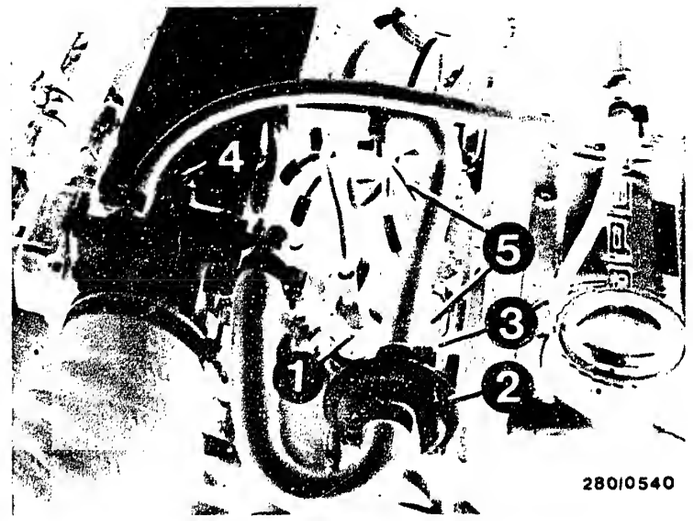
Temperature sensor II:

- From multiple plug term. 13 to temperature sensor II term. 13.
- From temperature sensor II term. 49 to central ground (lead 49).

Check all contacts in the plug-in connections.

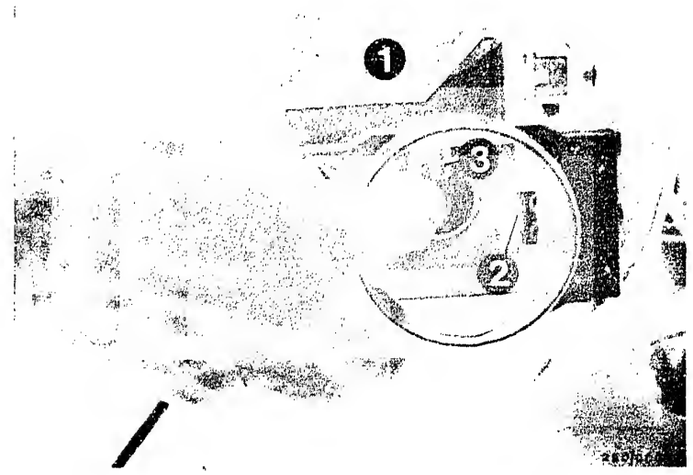
Continued on E 17/E 18

1) Applies only to 2.0 l engine



2 = Auxiliary-air device
3 = Temperature sensor II (engine)

1 = Air-flow sensor
3 = Temperature sensor I (air)

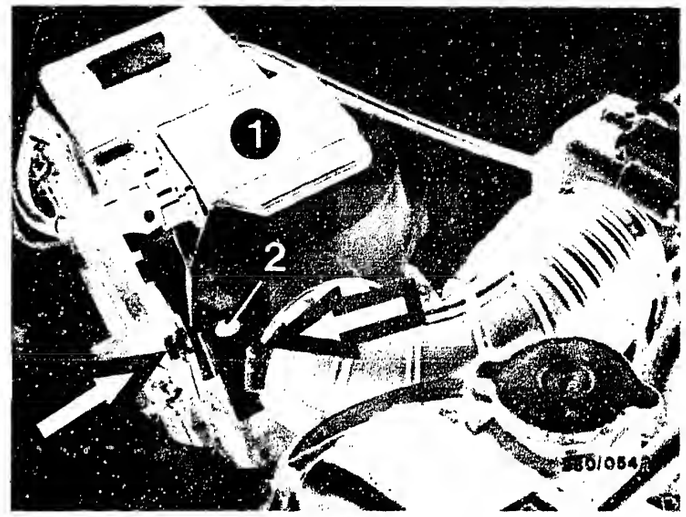


Air-flow sensor O.K.?

no

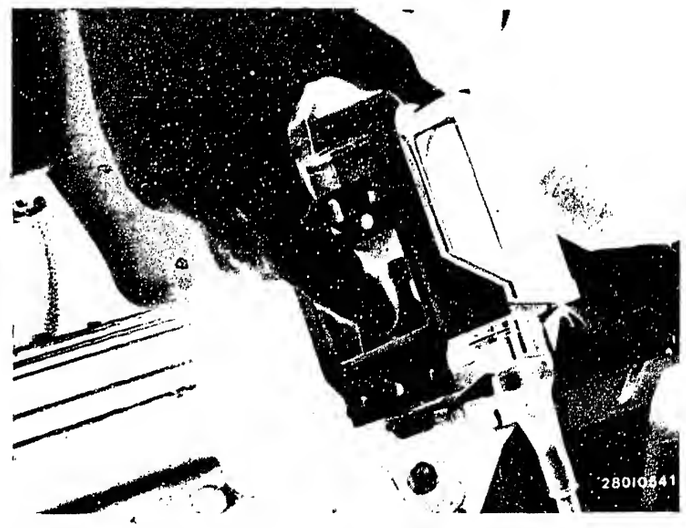
Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor. Connect ohm-meter to term. 7 and term. 8 of air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500 Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000 Ω
Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.
Caution:
After testing is completed, refit the hose between air filter and air-flow sensor. Securely tighten the hose clamp (leaks).

yes



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction = richer mixture
Arrows = Fastening screws

Opening the air-flow sensor flap



Starting motor operates, engine fails to start or starts only with great difficulty (Continued)

Are all hose lines and electric leads securely attached? Visual examination. Is the air-intake system leak-tight?

No →

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

Yes

Testing completed for customer complaint

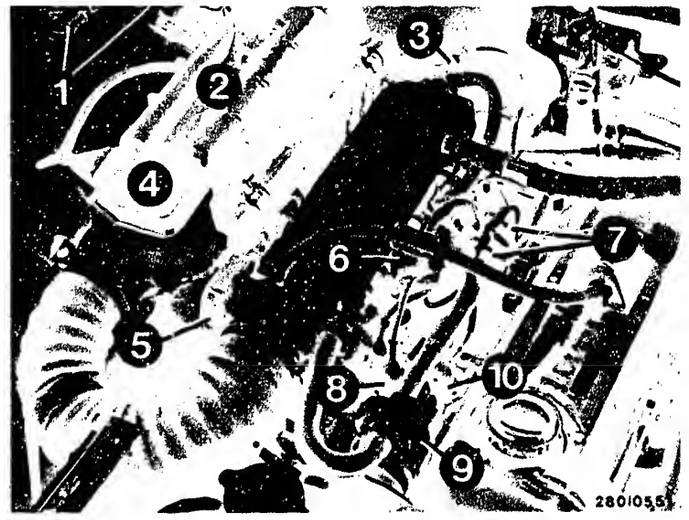
"Starting motor operates, engine fails to start"

Customer complaint remedied?

No →

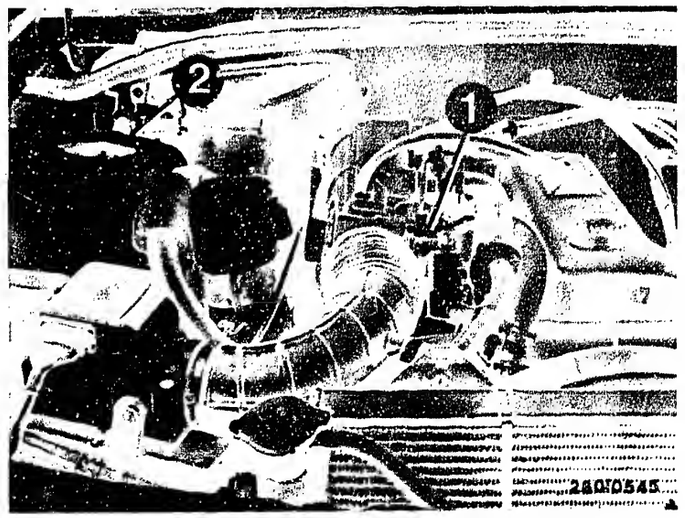
Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worm camshaft).



3 = Start valve (blue plug) (only on 1.9 l engine)
4 = Air-flow sensor
5 = Throttle-valve switch
8 = Thermo-time switch (brown plug) (only on 1.9 l engine)
9 = Auxiliary-air device (black plug)
10 = NTC II (white plug) (blue on 2.0 l engine)

1 = Solenoid-operated air valve
2 = Relay set



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into three rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.

Engine starts but then dies

↓ Yes

Ignition, engine etc O.K.? — No → Remedy fault in ignition and engine

↓ Yes

Test with universal test adapter already performed? — No → For testing see Coordinates B9...D13

↓ Yes

Fuel pressure test performed ? — No → For testing see Coordinates D14...E4

↓ Yes

Continued on E 23/E 24

Engine starts but then dies (continued)

Auxiliary-air device tested? (mechanically O.K.?)

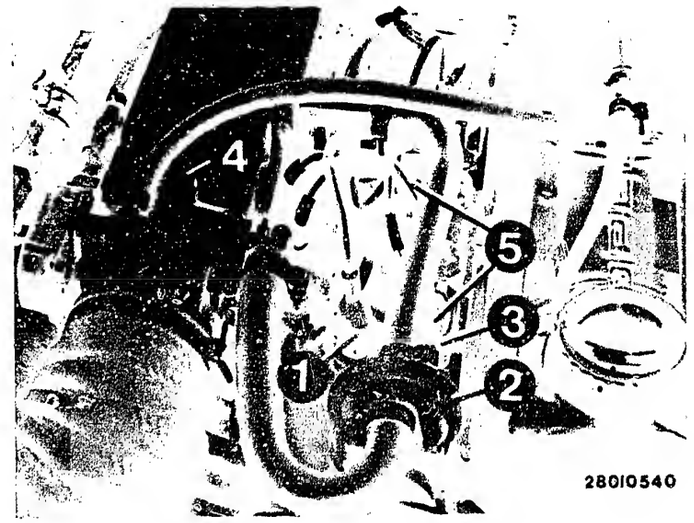
No →

Testing:

1. Visual examination of auxiliary-air device: When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device. (Remove hoses and look down, possibly using a small mirror).

2. Functional test of auxiliary-air device: With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary.air device (pay attention to direction of flow).

Yes



2 = Auxiliary-air device
3 = Temperature sensor II (engine)

Continued on F 1/ F 2

Engine starts but then dies (Continued)

Start valve O.K.?
(Leak test)
(Only for 1.9 l engine)

No →

Testing the start valve for leaks:

1. When installed:

Pinch off the fuel delivery line to the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

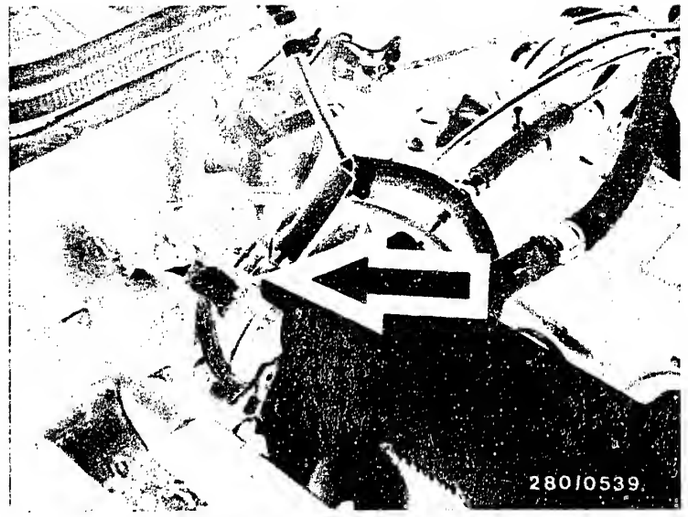
Remove start valve (caution! fire hazard!). Fuel line and electric lead remain connected (place collector vessel under the start valve). Build up fuel pressure (unscrew hose between air filter and air-flow sensor. Ignition "ON" and deflect air-flow sensor flap).

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

Caution!

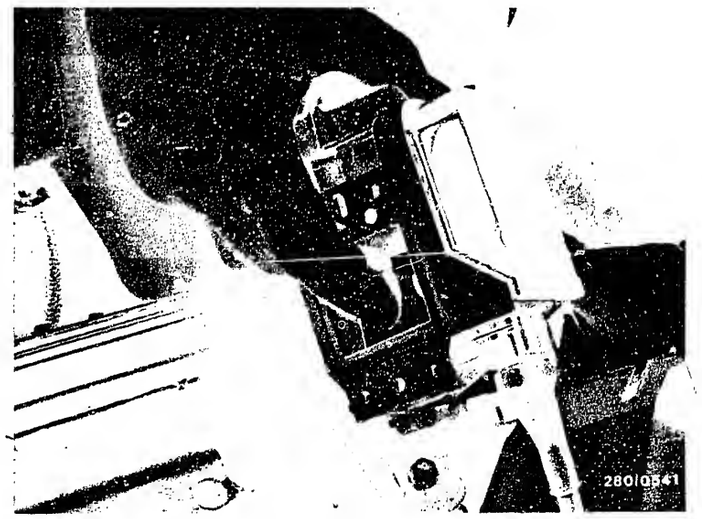
After testing is completed, refit the hose between air filter and air-flow sensor. Check connection for leaks and check ground connection (ground lead) on air-flow sensor.

Yes



Arrow = Start valve

Opening the air-flow sensor flap



Continued on F 3/F 4

Engine starts but then dies (continued)

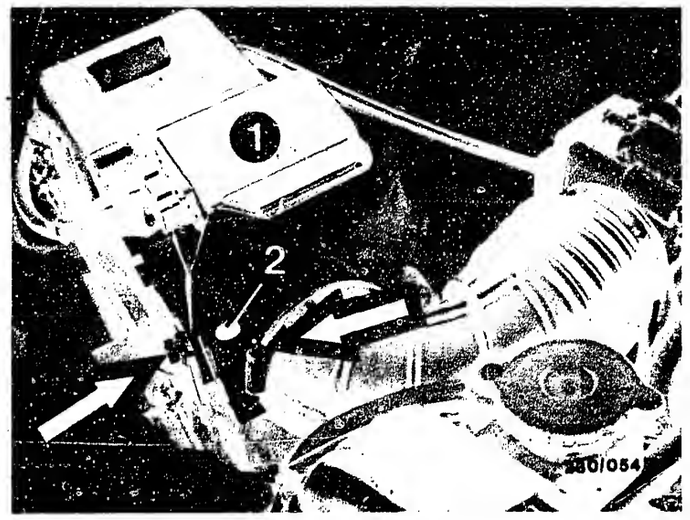
yes

Air-flow sensor O.K.? — no

yes

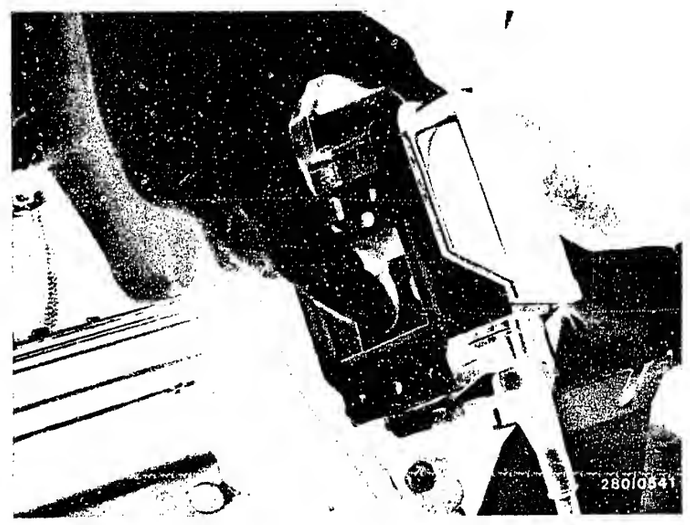
Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 7 and term. 8 of air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500 Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000 Ω

Test fuel pump contact in air-flow sensor:
1. Air-flow sensor up to FD 050:
Remove air hoses and connector. Connect ohmmeter to term. 36 and term. 39 of air-flow sensor. Open air-flow sensor flap slightly by hand. Reading must change from ∞Ω to 0Ω. If not, replace air-flow sensor.



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction = richer mixture
Arrows = fastening screws

Opening the air-flow sensor flap



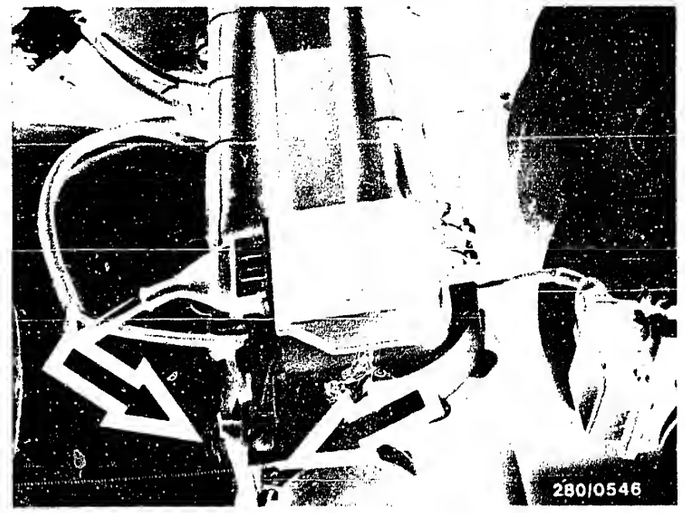
Continued on F 5/F 6

Engine starts but then dies (continued)

yes

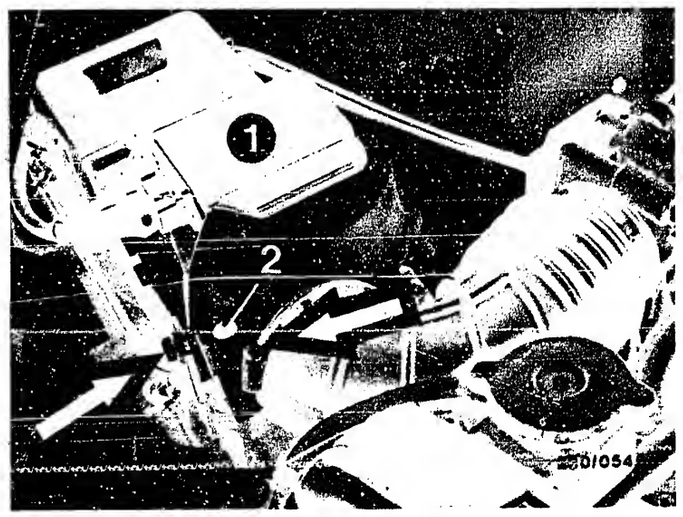
2. Air-flow sensor as of FD 051:
Engine stopped while hot
Remove plug from air-flow sensor and connect ohmmeter to term. 6 and term. 36.
Positive pole of ohmmeter to term. 6 = approx. 0Ω.
With reversed polarity: approx. ∞Ω.
If readings incorrect ⟶ replace air-flow sensor.

Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.
Caution:
After testing is completed, refit the hose between air filter and air-flow sensor. Securely tighten the hose clamp (leaks).



1.9 l engine

2.0 l engine



Continued on F 7/F 8

Engine starts but then dies (continued)

Are all hose lines and electric leads securely attached? Visual examination. Is the air-intake system leak-tight?

No → Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Checking for leaks:

Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

Check electric contacts for loose connection.

Yes

Testing completed for customer complaint

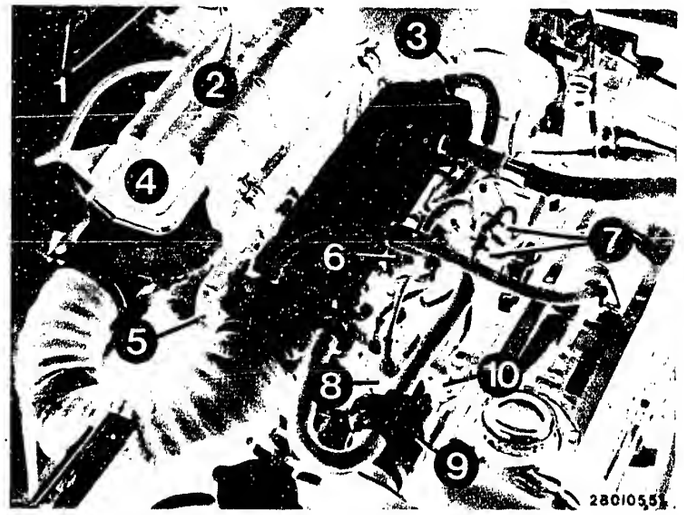
"Engine starts but then dies"

Customer complaint remedied?

No →

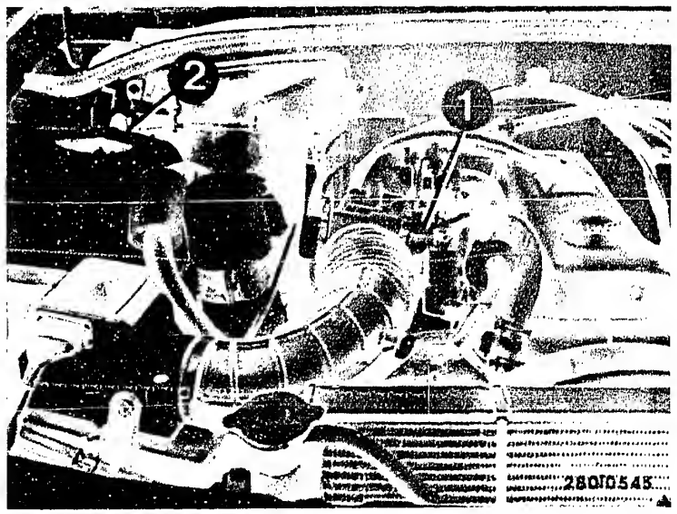
Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



3 = Start valve (blue plug) (only on 1.9 l engine)
4 = Air-flow sensor
5 = Throttle-valve switch
8 = Thermo-time switch (brown plug) (only on 1.9 l engine)
9 = Auxiliary-air device (black plug)
10 = NTC II (white plug) (blue on 2.0 l engine)

1 = Solenoid-operated air valve
2 = Relay set



Trouble-shooting program according to customer complaints

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If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment

Yes

Ignition, engine etc O.K.? — No → Remedy fault in ignition and engine

Yes

Test with universal test adapter already performed? — No → For testing see Coordinates B9...D13

Yes

Fuel pressure test performed ? — No → For testing see Coordinates D14...E4

Yes

Continued on F 11/F 12

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (Continued)

Throttle valve closed?

No →

Testing:
Throttle valve closed?
Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.
Adjustment:
Throttle valve must be set just before it sticks with the throttle-valve stop screw.
Straighten throttle linkage if bent.

Yes ↓

CO and idle speed correctly adjusted?

No →

CO and idle adjustment
Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

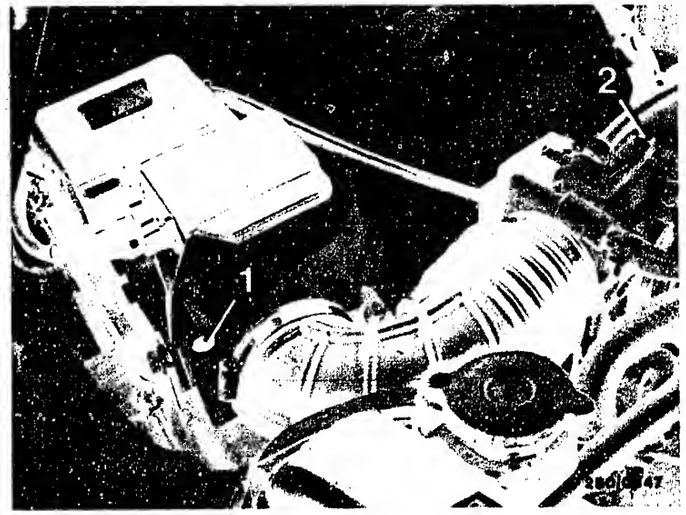
Idle speed	
1.9 l engine:	975...1025 min^{-1}
2.0 l engine:	850... 900 min^{-1}

CO adjustment	
1.9 l engine:	max. 1.5 % by vol. CO
2.0 l engine:	max. 1.0 % by vol. CO

Testing the solenoid-operated air valve
Let warmed-up engine idle with the air conditioner (if fitted) switched off. Connect connecting leads on solenoid-operated air valve to battery voltage. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.

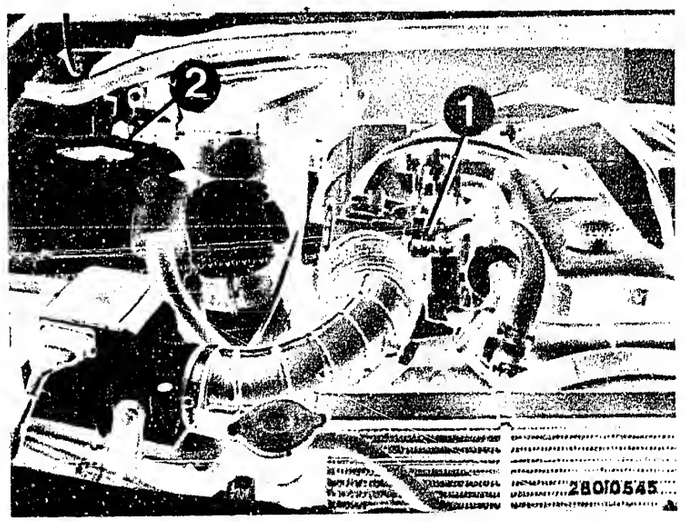
Yes ↓

Continued on F 13/F 14



2.0 l engine (1.9 l engine similar)

1 = CO adjusting screw
2 = Idle-speed adjusting screw



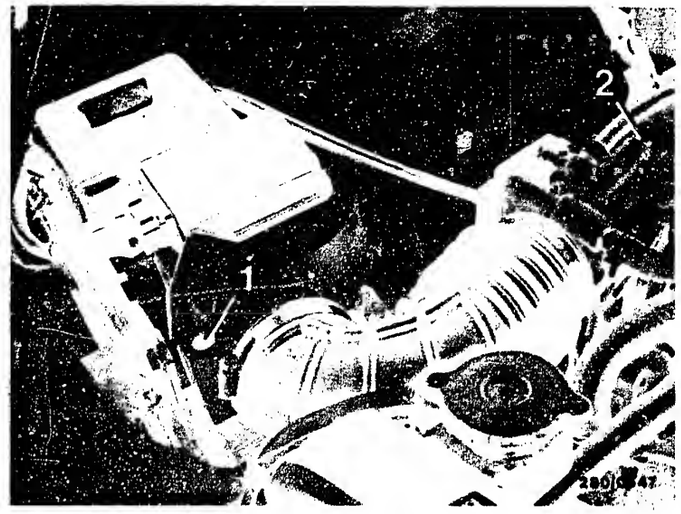
1 = Solenoid-operated air valve
2 = Relay set

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment
(Continued)

Yes

If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration again. Carry out adjustments in several steps. After adjusting, use new plugs.

As of FD 246: CO adjusting screw, hexagon-socket-head AF 5.



1 = CO adjusting screw
2 = Idle-speed-adjusting screw

Can idle speed not be adjusted?

Yes

Thermo-time switch O.K.? (Only for 1.9 l engine)

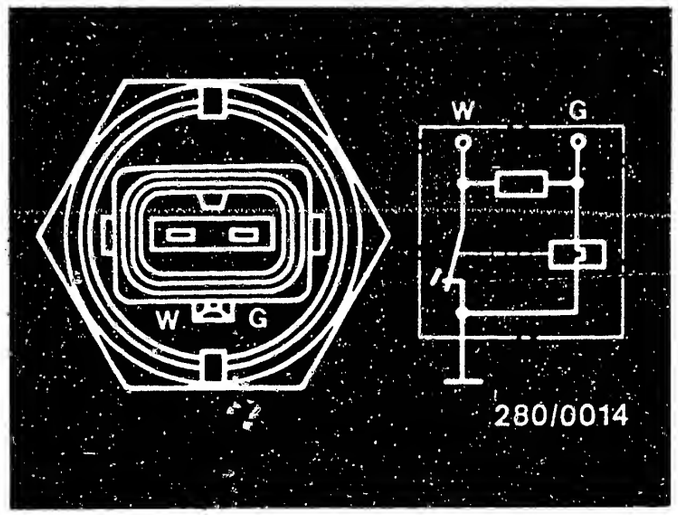
No

Yes

Electrical test

Test thermo-time switch 35°/8 sec. as follows: Remove plug and make direct resistance measurement at thermo-time switch using ohmmeter.

	Between term. "G" + ground	Between term. "W" + ground	Between term. "G" + "W"
Ambient temperature (below 30°C)	25...40 Ω	0 Ω	25...40 Ω
Engine at normal operating temperature (above 40°C)	50...80 Ω	100...160 Ω	50...80 Ω



Continued on F 15/F 16

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Start valve O.K.?
(Leak test)
(Only for 1.9 l engine)

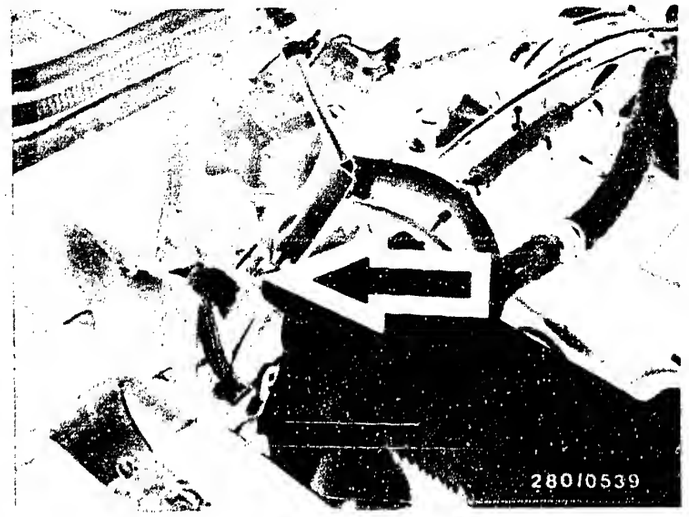
No

Testing the start valve for leaks:
1. When installed:
Pinch off the fuel delivery line to the start valve. If engine then runs smoothly, replace start valve.
2. When removed:
Remove start valve (caution! fire hazard!).
Fuel line and electric lead remain connected (place collector vessel under the start valve). Build up fuel pressure (unscrew hose between air filter and air-flow sensor. Ignition "ON" and deflect air-flow sensor flap).
Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

Caution!
After testing is completed, refit the hose between air filter and air-flow sensor.
Check connection for leaks and check ground connection (ground lead) on air-flow sensor.

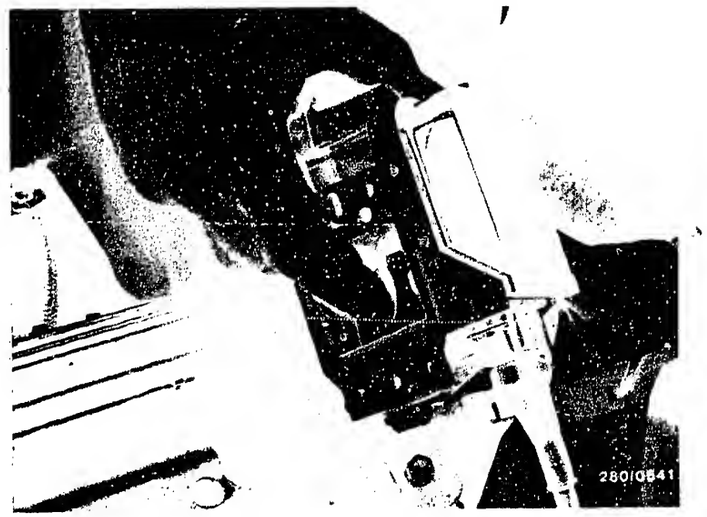
Yes

Continued on F 17/F 18



Arrow = Start valve

Opening the air-flow sensor flap



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (Continued)

Auxiliary-air device tested? (Mechanically O.K.?)

No →

Testing:
1. Visual examination of auxiliary-air device: When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device. (Remove hoses and look down, possibly using a small mirror).
2. Functional test of auxiliary-air device: With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

Yes ↓

Injection valve mechanically O.K.?

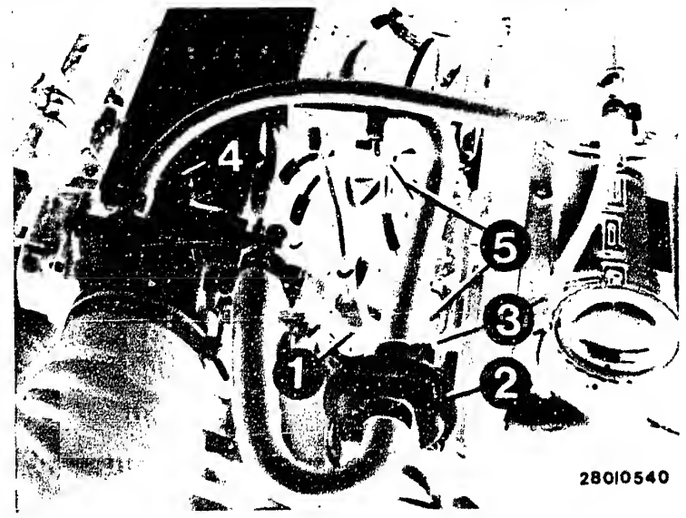
No →

With the engine running, remove the injection-valve connectors individually, one after the other, from the injection valves and plug on again.
Engine speed must drop if injection valve is O.K..
Test the following connecting leads for continuity:
- From relay set term. 88 b to series resistor term. 43.
- From series resistor through injection valves to control unit term. 14, 15, 32 and 33.

If necessary, replace leads, series resistor or injection valves.

Yes ↓

Continued on F 19/F 20



2 = Auxiliary-air device
3 = Temperature sensor II (engine)

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (Continued)

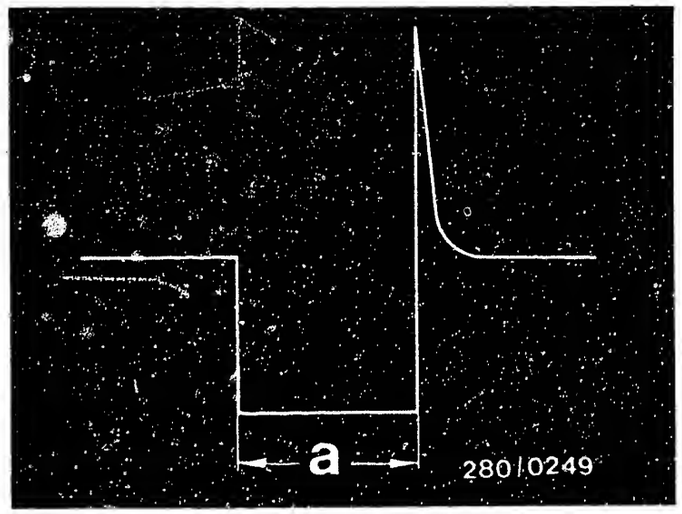
Injection valves checked for proper operation?

No →

Connect the test lead as follows:
The two-pole plug connectors of the test lead are connected between an injection valve and its connecting lead. Of the other two terminals of the test lead, only one must be connected to the special input of the motortester.
When the correct terminal is connected, the diagram shown opposite is visible.
Using the test lead, the injection pulses at the injection valves can be tested with an ignition oscilloscope with the engine running.
If the diagram opposite is not obtained or if there are deviations (interference, missing etc), the other injection valves should also be tested.
In case of interference → check routing of leads.
In case of missing → eliminate loose contacts in leads or in plug-in connections.

Yes

Continued on F 21/F 22



Injection pulse of a switched output stage

(measured at injection valve)
a = Pulse length
(dependent on engine load)

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (Continued)

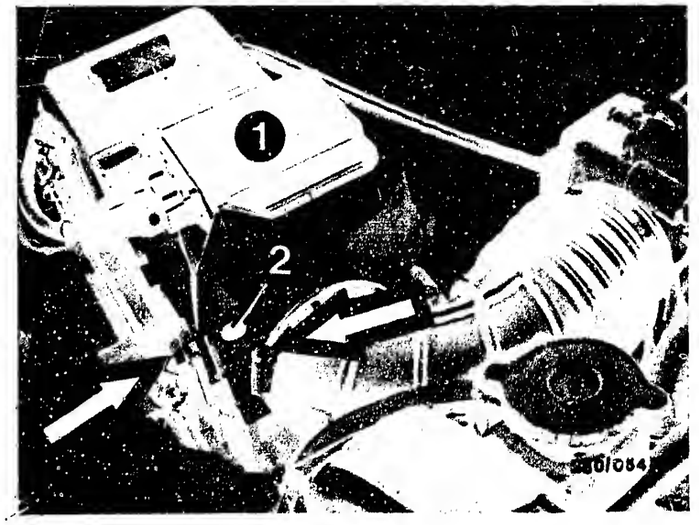
Air-flow sensor O.K.?

No →

Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor. Connect ohm-meter to term. 7 and term. 8 of air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500 Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000 Ω
Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.
Caution:
After testing is completed, refit the hose between air filter and air-flow sensor. Securely tighten the hose clamp (leaks).

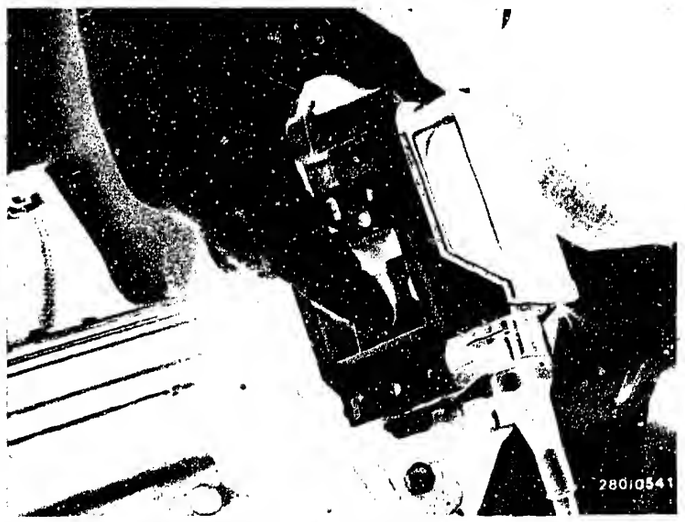
Yes

Continued on F 23/F 24



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction = richer mixture
Arrows = Fastening screws

Opening the air-flow sensor flap



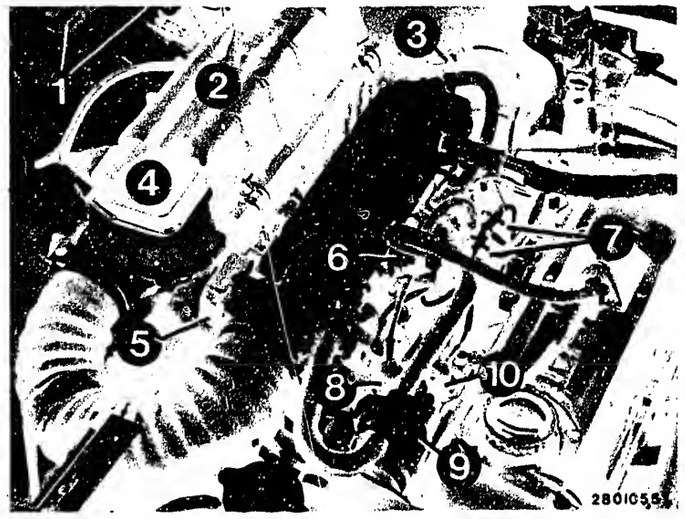
Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (Continued)

Are all hose lines and electric leads securely attached? Visual examination. Is the air-intake system leak-tight?

No → Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

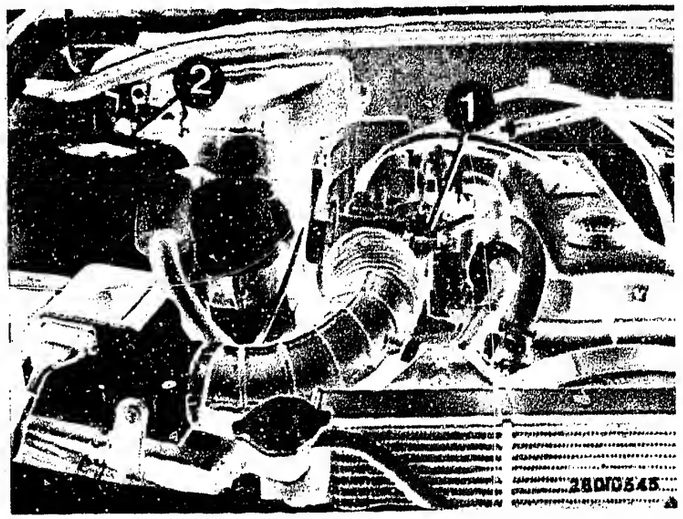
Yes

Continued on G 1/G 2



3 = Start valve (blue plug) (only on 1.9 l engine)
4 = Air-flow sensor
5 = Throttle-valve switch
8 = Thermo-time switch (brown plug) (only on 1.9 l engine)
9 = Auxiliary-air device
10 = NTC II (white plug) (blue on 2.0 l engine)

1 = Solenoid-operated air valve
2 = Relay set



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (Continued)

CO and idle speed correctly adjusted? Repeat Solenoid-operated air valve O.K.?

No

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed

1.9 l engine:	975...1025 min^{-1}
2.0 l engine:	850... 900 min^{-1}

CO adjustment

1.9 l engine:	max. 1.5 % by vol. CO
2.0 l engine:	max. 1.0 % by vol. CO

Testing the solenoid-operated air valve:

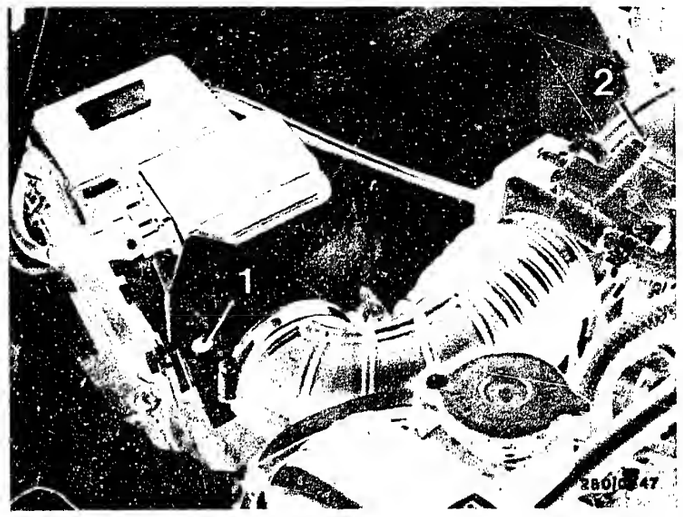
Let warmed-up engine idle with the air conditioner (if fitted) switched off. Connect connecting leads on solenoid-operated air valve to battery voltage. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.

If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration again. Carry out adjustments in several steps. After adjusting, use new plugs.

As of FD 246: CO adjusting screw, hexagon-socket-head AF 5.

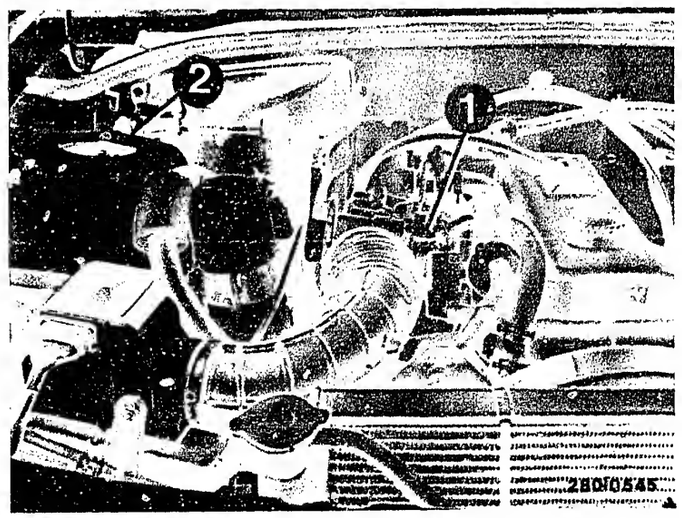
Yes

Continued on G 3/G 4



1 = CO adjusting screw
2 = Idle-speed-adjusting screw

1 = Solenoid-operated air valve
2 = Relay set



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (Continued)

Testing completed for customer complaint

"Uneven engine idle"

Customer complaint remedied?

No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8).
  If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K.
  (Compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into three rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.

Poor throttle take-up

Yes

Ignition, engine etc O.K.?

No → Remedy fault in ignition and engine

Yes

Test with universal test adapter already performed?

No → For testing see Coordinates B9...D13

Yes

Fuel pressure test performed ?

No → For testing see Coordinates D14...E4

Yes

Continued on G7/G8

Poor throttle take-up (continued)

Temperature sensors tested?

No

Testing:
Temperature sensor I measures the intake air temperature and is located in the air duct of the air-flow sensor. Measure the following values between term. 27 and term. 6 of air-flow sensor:

At ambient temperature (approx. 15...30°C):	1.45...3.3 kΩ
With engine at normal operating temperature (approx. 80°C):	280...360 Ω

Make direct resistance measurement at temperature sensor II (engine) using ohmmeter. Resistance measurement at term. 13 and term. 49 (ground):

At ambient temperature (approx. 15...30°C):	1.3...3.6 kΩ 1.45...3.3 kΩ[1)]
With engine at normal operating temperature (approx. 80C):	250 ...390Ω (280...360Ω)[1)]

If incorrect, test the following leads for open circuit or short circuit using ohmmeter:

Temperature sensor I:
- From multiple plug term. 27 to air-flow sensor term. 27.
- From air-flow sensor term. 6 to multiple plug term. 6

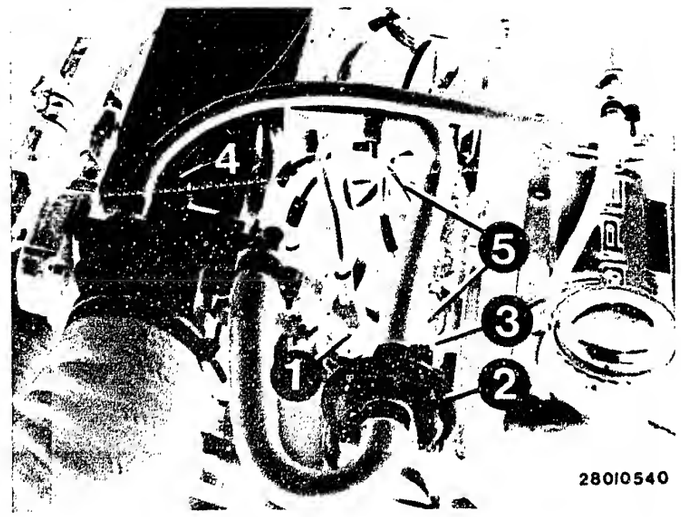
Temperature sensor II:
- From multiple plug term. 13 to temperature sensor II term. 13.
- From temperature sensor II term. 49 to central ground (lead 49).

Check all contacts in the plug-in connections.

Yes

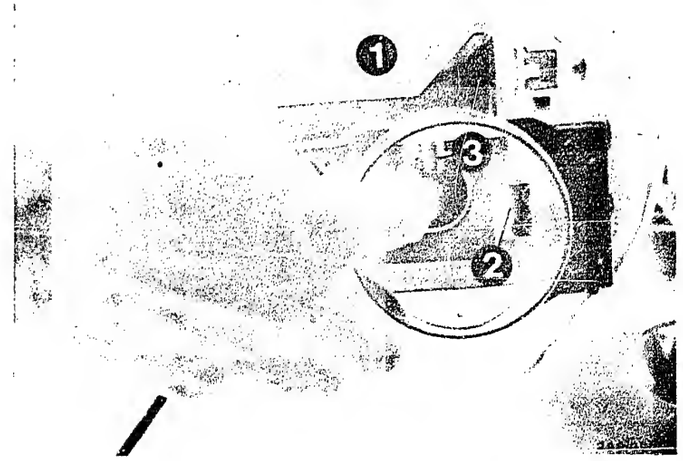
Continued on G 9/G 10

[1)] Applies only to 2.0 l engine



2 = Auxiliary-air device
3 = Temperature sensor II (engine)

1 = Air-flow sensor
3 = Temperature sensor I (engine)



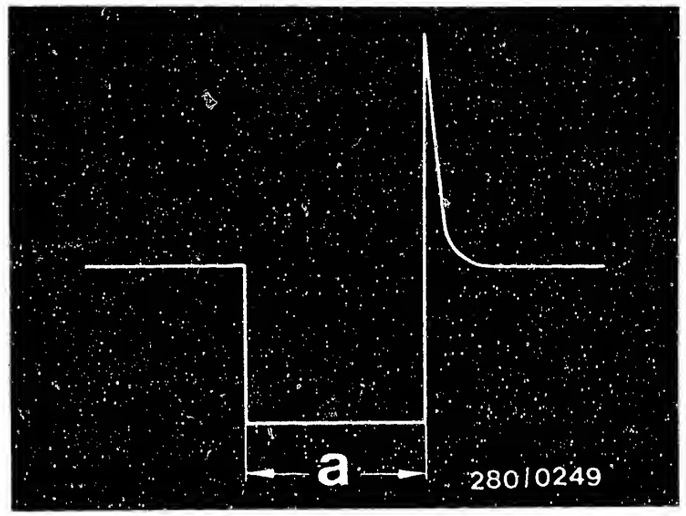
Poor throttle take-up (continued)

Solenoid-operated injection valves tested for proper operation?

no

Connect the test lead as follows:
The two-pole plug connectors of the test lead are connected between a solenoid-operated injection valve and its connecting lead. Of the other two terminals of the test lead, only one must be connected to the special input of the motortester.
When the correct terminal is connected, the picture opposite can be seen on the oscilloscope.
With the aid of the test lead it is possible with an ignition oscilloscope to test the injection pulses at the injection valves with the engine running.
If the picture opposite is not obtained or if there are deviations (interference, missing etc.), the other injection valves should also be tested.
In case of interference → check routing of the leads.
In case of missing → remedy loose contacts in leads or in plug-in connections.

yes



Injection pulse of a switched output stage
(measured at injection valve)
a = Pulse length
(dependent on engine load)

Continued on G 11/G 12

Poor throttle take-up (continued)

Auxiliary-air device tested? (Mechanically O.K.?)

No

Testing:

1. Visual examination of auxiliary-air device: When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device. (Remove hoses and look down, possibly using a small mirror).

2. Functional test of auxiliary-air device: With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

Yes

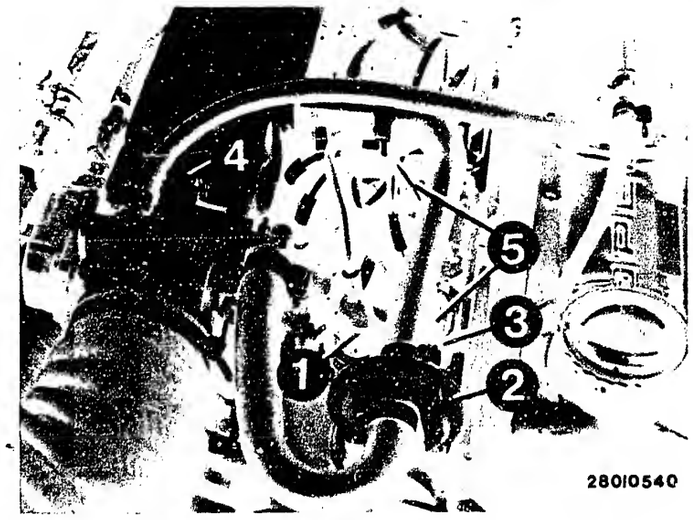
Air-flow sensor O.K.?

No

Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor.

Yes

Continued on G 13/G 14



1.9 l engine (2.0 l engine similar)

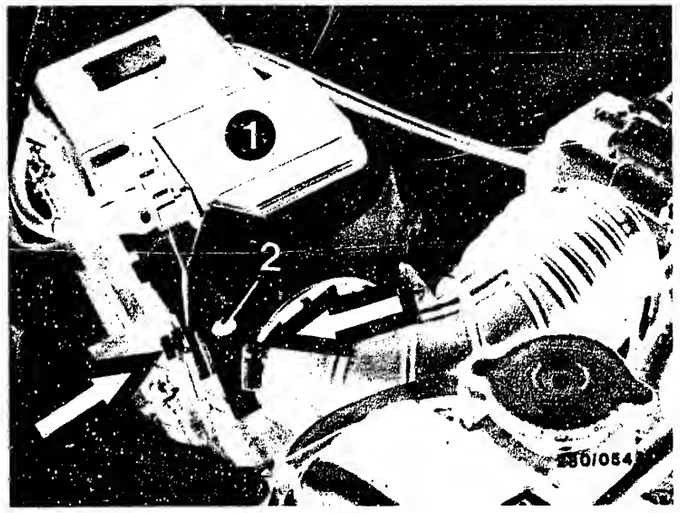
2 = Auxiliary-air device
3 = Temperature sensor II (engine)

Opening the air-flow sensor flap

Poor throttle take-up (continued)

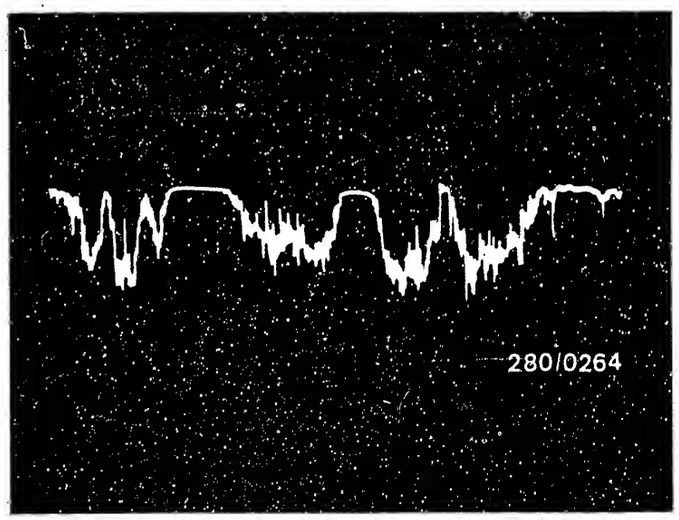
yes

Electrical test: Connect ohmmeter to term. 7 and term. 8 of the air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000Ω
Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.
Potentiometer test (noise test)
Remove hose between air filter and air-flow sensor. Leave plug on.
Set motortester to "special input" and, using special cable, connect to air-flow sensor term. 7 (red clip) and term. 6 (black clip). Set control lever for image adjustment on motortester as far as it will go to the left (calibrated setting). Ignition "ON". Deflect air-flow sensor flap suddenly several times. A continuous stroke signal must be visible on the oscilloscope. If incorrect (see picture) ⟶ replace air-flow sensor.



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment) Turning in clockwise direction = richer mixture
Arrows = Fastening screws

Incorrect noise signal



Continued on G 15/G 16

Poor throttle take-up (continued)

Caution!
After testing is completed, the hose between air filter and air-flow sensor must be fitted again. Make sure that hose clamp is tight. Do not bend any terminals in the plug.

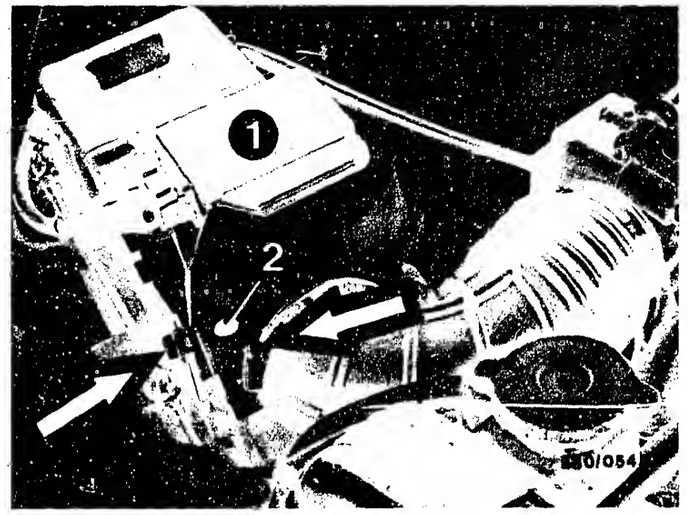
Yes

Are all hose lines and electric leads securely attached? Visual examination. Is the air-intake system leak-tight?

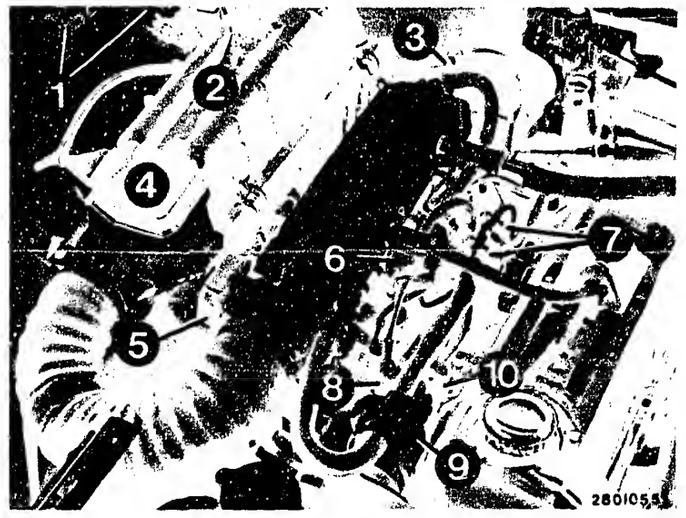
No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

Yes



3 = Start valve (blue plug) (only on 1.9 l engine)
4 = Air-flow snesor
5 = Throttle-valve switch
8 = Thermo-time switch (brown plug) (only on 1.9 l engine)
9 = Auxiliary-air device (black plug)
10 = Temperature sensor II (white plug) (blue on 2.0 l engine)



Poor throttle take-up (continued)

Throttle valve closed?

No →

Testing:
Throttle valve closed?
Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.
Adjustment:
Throttle valve must be set just before it sticks with the throttle-valve stop screw.
Straighten throttle linkage if bent.

Yes ↓

CO and idle speed correctly adjusted? Solenoid-operated air valve O.K.?

No →

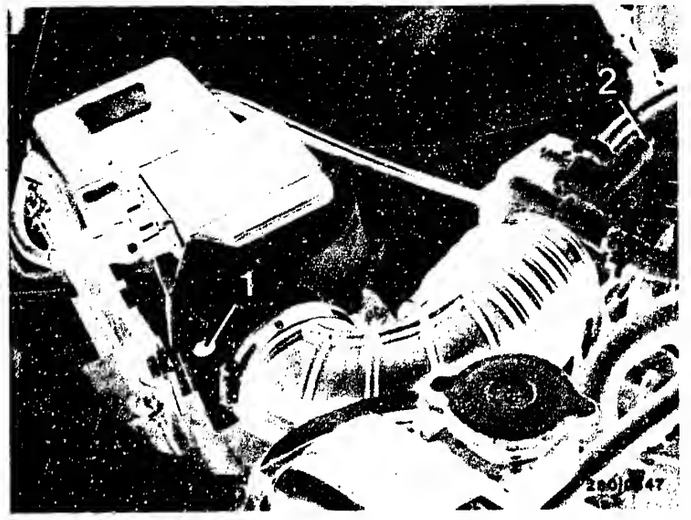
CO and idle adjustment
Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed	
1.9 l engine:	975...1025 min^{-1}
2.0 l engine:	850... 900 min^{-1}
CO adjustment:	
1.9 l engine:	max. 1.5 % by vol. CO
2.0 l engine:	max. 1.0 % by vol. CO

Testing the solenoid-operated air valve
Let warmed-up engine idle with the air conditioner (if fitted) switched off. Connect connecting leads on solenoid-operated air valve to battery voltage. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.

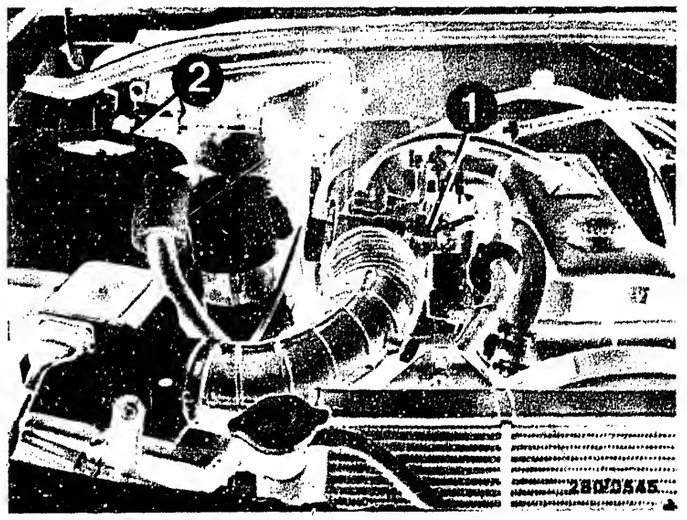
Yes ↓

Continued on G 19/G 20



2.0 l engine (1.9 l engine similar)

1 = CO adjusting screw
2 = Idle-speed adjusting screw



1 = Solenoid-operated air valve
2 = Relay set

Poor throttle take-up (continued)

Yes

Can idle speed not be adjusted?

Yes

Testing completed for customer complaint

"Poor throttle-take-up"

Customer complaint remedied?

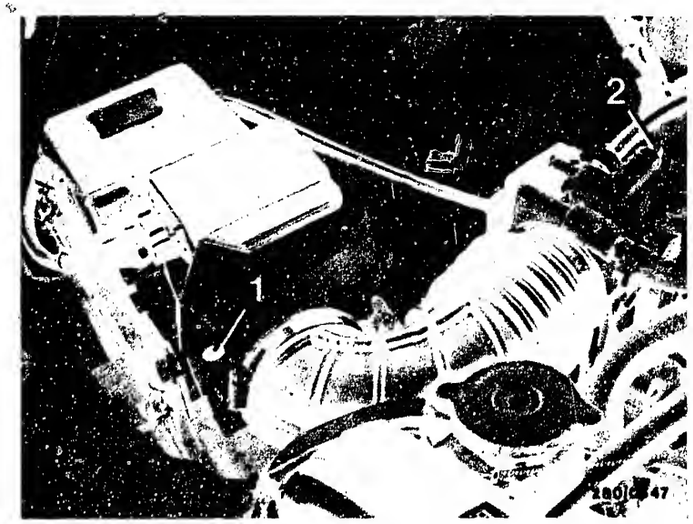
No

If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check idle speed and CO concentration again. Carry out adjustments in several steps. After adjusting, use new plugs.

As of FD 246: CO adjusting screw, hexagon-socket-head AF 5.

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



2.0 l engine (1.9 l engine similar)

1 = CO adjusting screw
2 = Idle-speed adjusting screw

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into three rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.

Engine missing under all operating conditions

Yes

Ignition, engine etc O.K.? — No → Remedy fault in ignition and engine

Yes

Test with universal test adapter already performed? — No → For testing see Coordinates B9...D13

Yes

Fuel pressure test performed ? — No → For testing see Coordinates D14...E4

Yes

Continued on H 3/H 4

Engine missing under all operating conditions (continued)

Plug-in connection of Jetronic wiring harness O.K.?

No → Check all plug-in connections for security and corrosion. Ensure a good ground connection.
(Terminals 5, 16, 17 and 49).

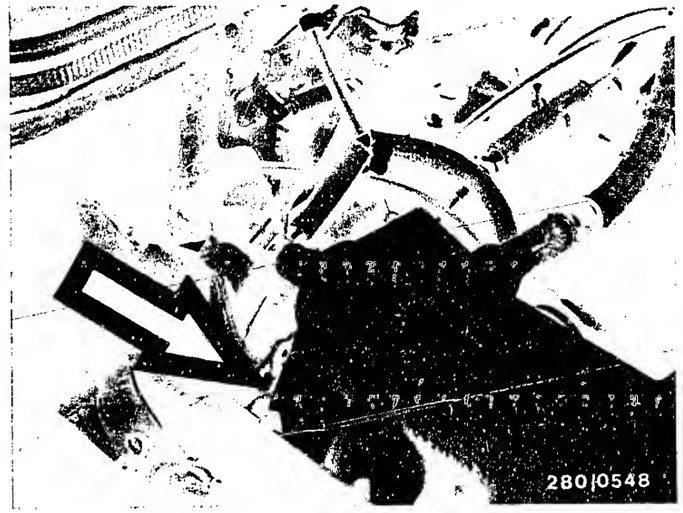
Yes

Power supply to injection system O.K.?
Loose contacts?
Relay set O.K.?

No → Remove both wiring-harness plugs from the relay set. Check whether all blade receptacles and leads are O.K.
Plug on relay set and turn round so that the connection bases are accessible from below. Test power supply. Switch on ignition. Using voltmeter, measure battery voltage at term. 88z, 88b and 88a to vehicle ground.
No voltage → test connecting leads.
If necessary, replace relay set.
Test all connecting leads for continuity.
Move wiring harness when doing this.
Suspicion of line breaks.

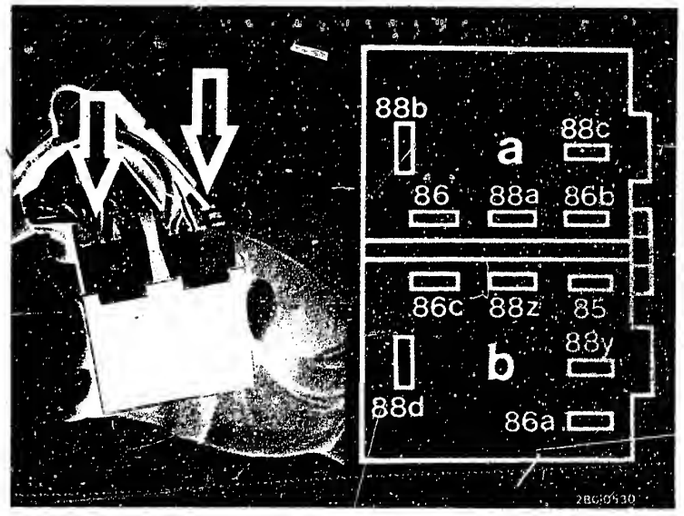
Yes

Continued on H 5/H 6



Arrow = Central ground terminal on intake manifold near start valve

Measure voltage on back of plug
a = Jetronic wiring harness
b = Vehicle wiring harness



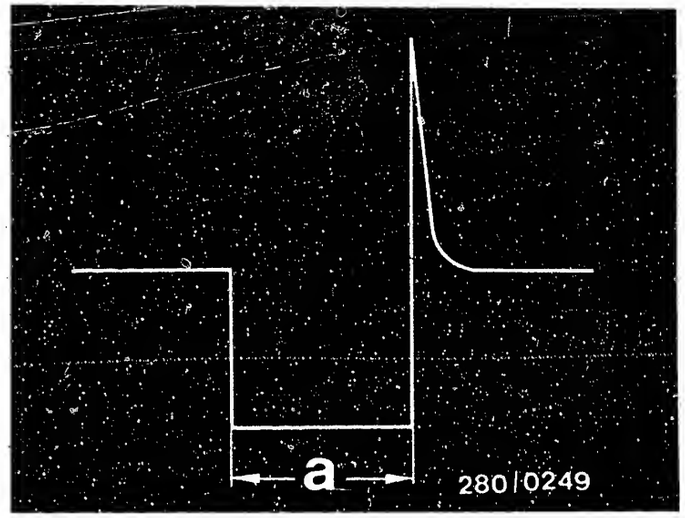
Engine missing under all operating conditions (continued)

Generator with regulator O.K.? (Engine missing due to voltage peaks).

no

Connect the test lead as follows:
The two-pole plug connectors of the test lead are connected between a solenoid-operated injection valve and its connecting lead. Of the other two terminals of the test lead, only one must be connected to the special input of the motortester.
When the correct terminal is connected, the picture opposite can be seen on the oscilloscope.
With the aid of the test lead it is possible with an ignition oscilloscope to test the injection pulses at the injection valves with the engine running.
If the picture opposite is not obtained or if there are deviations (interference, missing etc.), the other injection valves should also be tested.
With the engine stopped, remove the plug from the alternator. Start the engine. If missing stops, test the alternator and regulator. Voltage peaks are visible on the ignition oscilloscope.
In case of interference → check routing of the leads.
In case of missing → remedy loose contacts in leads or in plug-in connections.

yes



Injection pulse of a switched output stage
(measured at injection valve)
a = Pulse length
(dependent on engine load)

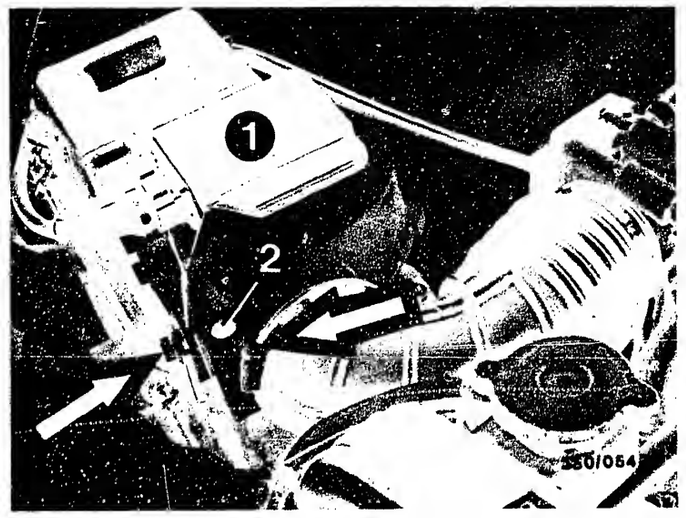
Continued on H 7/H 8

Air-flow sensor O.K.?

No

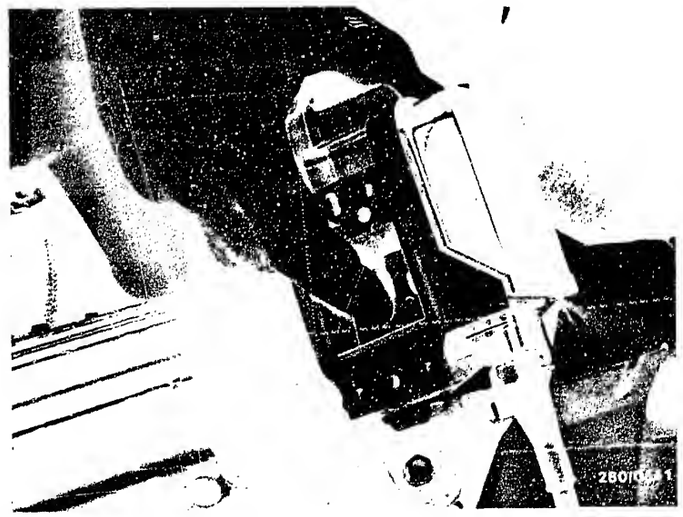
Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 7 and term. 8 of air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500 Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000 Ω
Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.

yes



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction = richer mixture
Arrows = Fastening screws

Opening the air-flow sensor flap



Continued on H 9/H 10

Engine missing under all operating conditions (continued)

Checking the pump contact:
1. Remove plug from air-flow sensor. Using ohmmeter, measure resistance between term. 36 and term. 39.
Deflect air-flow sensor flap.
Set value approx. 0 Ω.

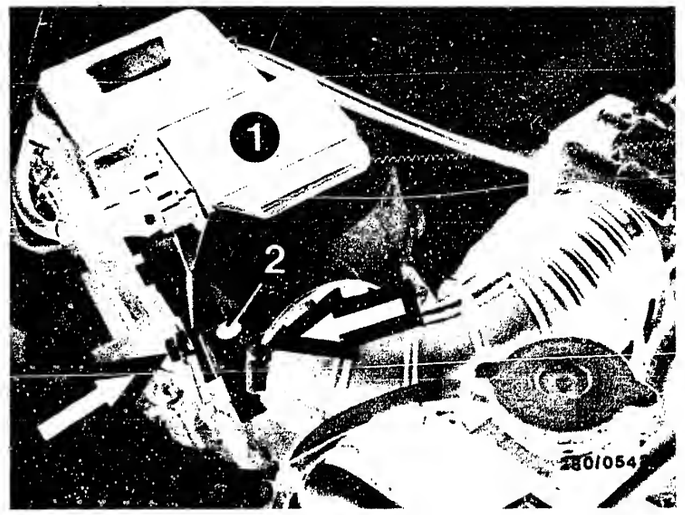
2. Air-flow sensors as from FD 051:
Stop engine while hot
Remove plug from air-flow sensor and connect ohmmeter to term. 6 and term. 36.
Positive pole of ohmmeter to term. 6 = approx. 0 Ω. With reversed polarity: approx. ∞ Ω.
If readings different → replace air-flow sensor.

Remove hose between air filter and air-flow sensor. Leave connector on. Set motortester to special input and connect, using special cable, to air-flow sensor term. 7 (red clip) and term. 6 (black clip).
Set control lever for image adjustment on motortester as far as it will go to the left (calibrated setting). Ignition "ON".

Yes

Deflect air-flow sensor flap suddenly several times. A continuous stroke signal must be visible on the oscilloscope. If incorrect (see picture) ⟶ replace air-flow sensor.

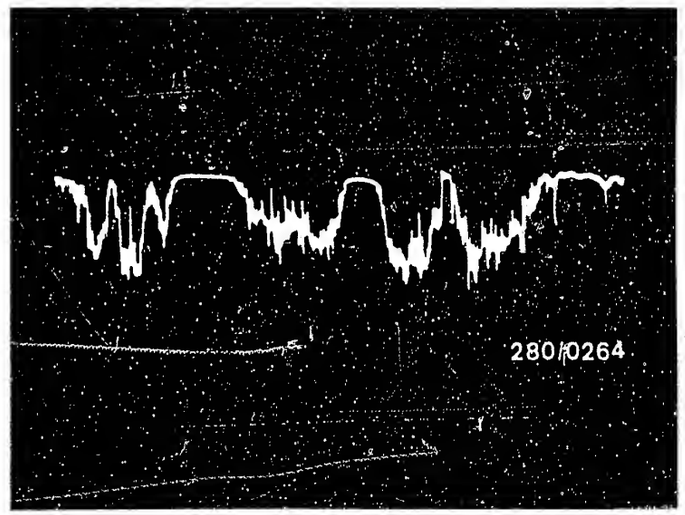
Caution!
When test is completed, the hose between air filter and air-flow sensor must be fitted again. Make sure that hose clamp is tight (leaks).
Do not bend any of the terminals.



2.0 l engine (1.9 engine similar)

1 = Air-flow sensor
2 = Bypass screw
(CO adjustment)
Turning in clockwise direction
= richer mixture
Arrows = Fastening screws

Incorrect noise signal



Continued on H 11/H 12

Fuel delivery O.K.?

No

Measuring the fuel delivery:
For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.
Remove air hose to air filter on air-flow sensor. Open air-flow sensor flap by hand until pump operates.

Test specification: min. 675 cm³/30 s

Remedy if test specification not reached:
- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts; possibly also eliminate poor ground connection; replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.

Caution! After testing is completed, refit the hose between air filter and air-flow sensor. Securely tighten hose clamp. Check for leaks.

Yes

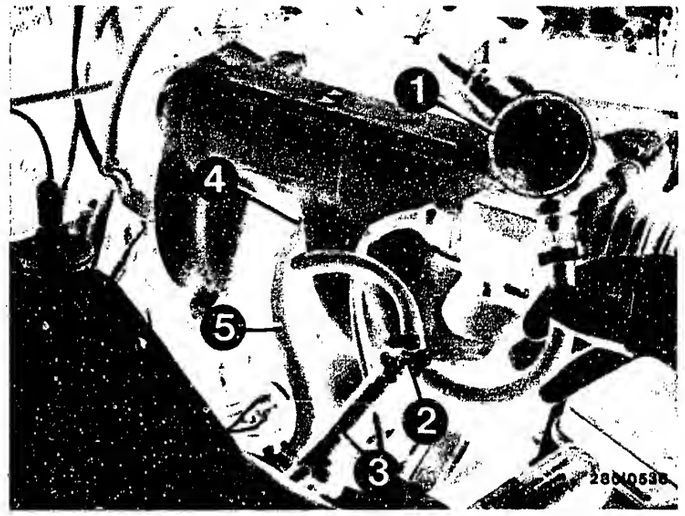
Control unit O.K.?

No

Let engine run. Shake control unit lightly and move multiple plug.
Watch for engine missing.
Repair plug-in connection on multiple plug or replace defective control unit.

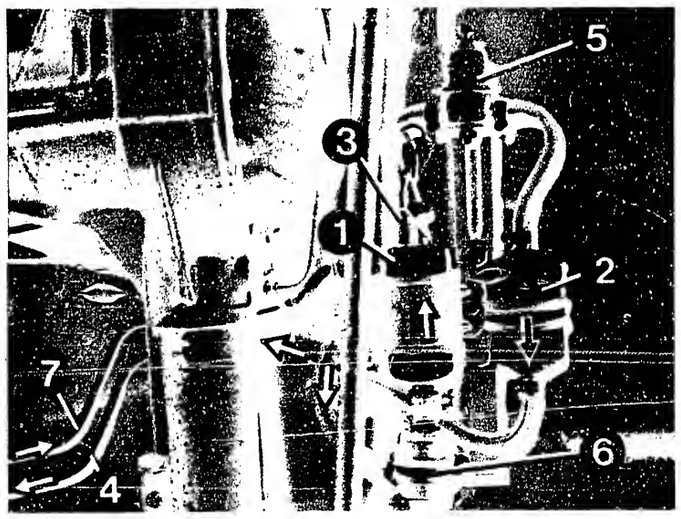
Yes

Continued on H 13/H 14



3 = Fuel delivery line
4 = Pressure regulator
5 = Fuel return line

Fuel pump installation on Manta, Ascona: (Rekord similar), Kadett in luggage compartment behind a cover)
1 = Electric fuel pump
2 = Fuel filter
4 = Fuel delivery line
7 = Fuel return line



Engine missing under all operating conditions (continued)

Burbling on the overrun?
Throttle valve closed?
CO and idle adjustment O.K.?
Injection pulses O.K.?

no →

1. Check the exhaust system for leaks.
2. Throttle valve closed?

Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.

Adjustment:
Throttle valve must be set just before it sticks with the throttle-valve stop screw. Straighten throttle linkage if bent.

CO and idle adjustment
Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed	
1.9 l engine:	975...1025 min^{-1}
2.0 l engine:	850... 900 min^{-1}
CO adjustment:	
1.9 l engine:	max. 1.5 % by vol. CO
2.0 l engine:	max. 1.0 % by vol. CO

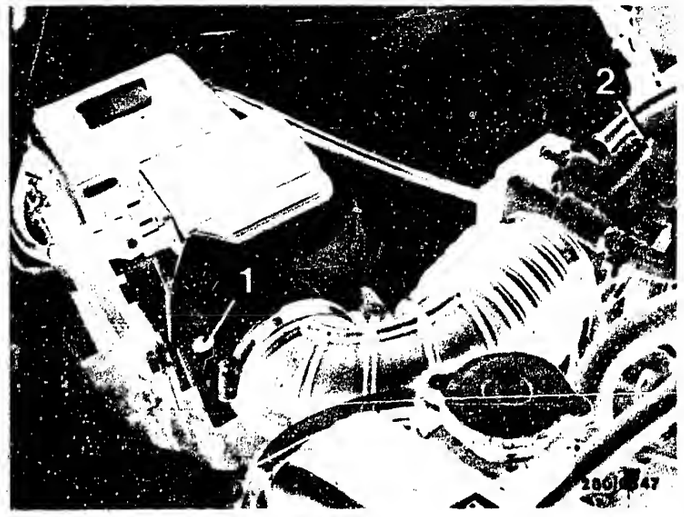
Testing the solenoid-operated air valve:
Let warmed-up engine idle with the air conditioner (if fitted) switched off. Connect connecting leads on solenoid-operated air valve to battery voltage. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.

If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration again. Carry out adjustments in several steps. After adjusting, use new plugs.

As of FD 246: CO adjusting screw, hexagon-socket-head AF 5.

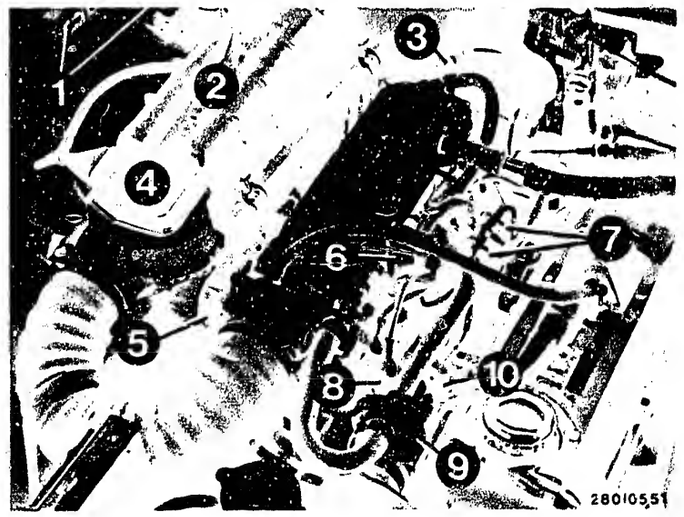
yes

Continued on H 15/H 16



1 = CO adjusting screw
2 = Idle-speed-adjusting screw

5 = Throttle-valve switch



Engine missing under all operating conditions (continued)

Testing completed for customer complaint

"Engine missing"

Customer complaint remedied?

No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into three rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.

Fuel consumption too high

Yes

Ignition, engine etc O.K.? — No → Remedy fault in ignition and engine

Yes

Test with universal test adapter already performed? — No → For testing see Coordinates B9...D13

Yes

Fuel pressure test performed ? — No → For testing see Coordinates D14...E4

Yes

Continued on H 19/H20

Fuel consumption too high (continued)

Have all brakes released fully?

Yes

Start valve O.K.? (Checking for leaks) (only for 1.9 l engine)

No

Testing the start valve for leaks:

1. When installed

Pinch off the fuel delivery line to the start valve. If engine then runs smoothly, replace start valve.

2. When removed

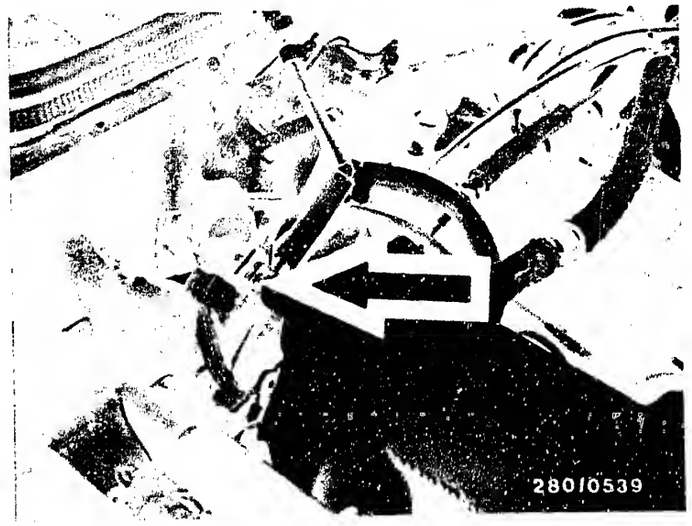
Remove start valve (Caution! Fire Hazard!). Fuel line and electric lead remain connected (place collector vessel under the start valve). Build up fuel pressure (remove hose between air filter and air-flow sensor. Ignition "ON" and deflect air-flow sensor flap).

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

Caution!

After the test is completed, the hose between air filter and air-flow sensor must be fitted again. Make sure the hose clamp is tight (leaks).

Yes



Arrow = Start valve

Continued on H 21/H 22

Fuel consumption too high (continued)

Temperature sensors tested? — No

Yes

Testing:
Temperature sensor I measures the intake air temperature and is located in the air duct of the air-flow sensor. Measure the following values between term. 27 and term. 6 of air-flow sensor:

At ambient temperature (approx. 15...30°C):	1.45...3.3 kΩ
With engine at normal operating temperature (approx. 80°C):	280...360 Ω

Make direct resistance measure at temperature sensor II (engine) using ohmmeter. Resistance measurement at term. 13 and term. 49 (ground):

At ambient temperature (approx. +15°...+30°C):	1.3...3.6 kΩ 1.45...3.3 kΩ [1]
With engine at normal operating temperature (approx. +80°C):	250...390Ω (280...360Ω) [1]

If incorrect, test the following leads for open circuit or short circuit using ohmmeter:

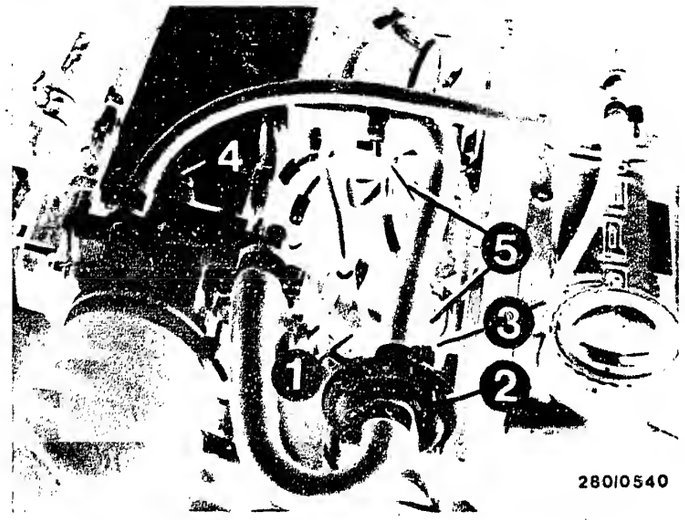
Temperature sensor I:
- From multiple plug term. 27 to air-flow sensor term. 27.
- From air-flow sensor term. 6 to multiple plug term. 6

Temperature sensor II:
- From multiple plug term. 13 to temperature sensor II term. 13.
- From temperature sensor II term. 49 to central ground (lead 49).

Check all contacts in the plug-in connections.

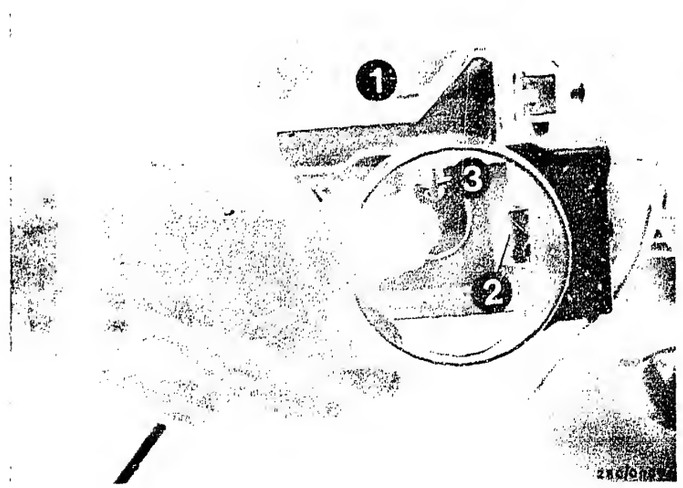
[1] Applies only to 2.0 l engine

Continued on H 23/H 24



2 = Auxiary-air device
3 = Temperature sensor II (engine)

1 = Air-flow sensor
3 = Temperatur sensor I



Fuel consumption too high (continued)

Injection valve mechanically O.K.?

No → With the engine running, disconnect the injection valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve is O.K. Test for continuity in connecting leads of relay set term. 88b and term. 43 via the injection valves to control unit term. 14, 15, 32 and 33. If necessary, replace leads or solenoid-operated injection valves.

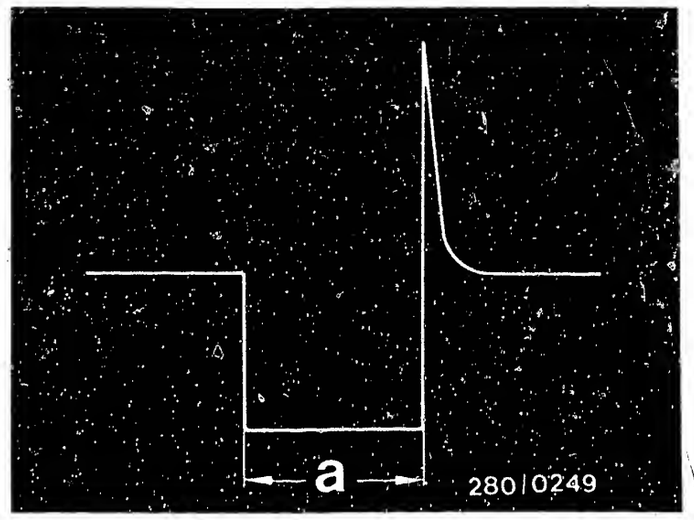
Yes

Injection valves checkend for proper operation?

No → Connect the test lead as follows: The two-pole plug connectors of the test lead are connected between an injection valve and its connecting lead. Of the other two terminals of the test lead, only one must be connected to the special input of the motortester.

Yes

When the correct terminal is connected, the diagram shown opposite is visible. Using the test lead, the injection pulses at the injection valves can be tested with an ignition oscilloscope with the engine running. If the diagram opposite is not obtained or if there are deviations (interference, missing etc), the other injection valves should also be tested. In case of interference - check routing of leads. In case of missing: Eliminate loose contacts in leads or in plug-in connections.



Injection pulse of a switched output stage
(measured at injection valve)
a = Pulse length
(dependent on engine load)

Continued on J 1/J 2

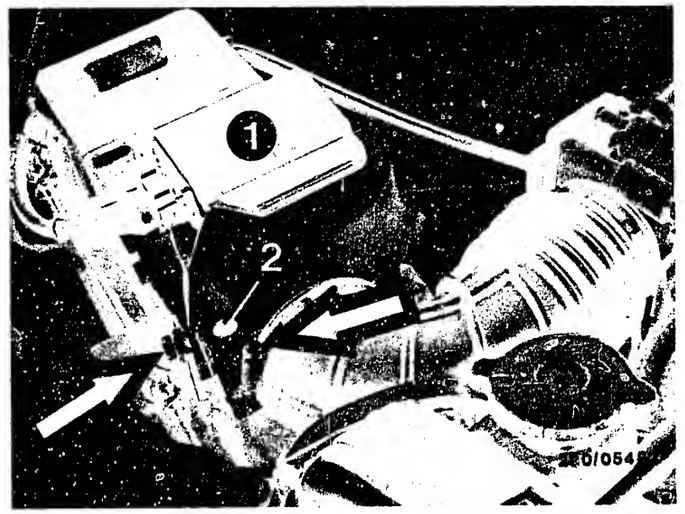
Fuel consumption too high (continued)

Air-flow sensor O.K.?

no

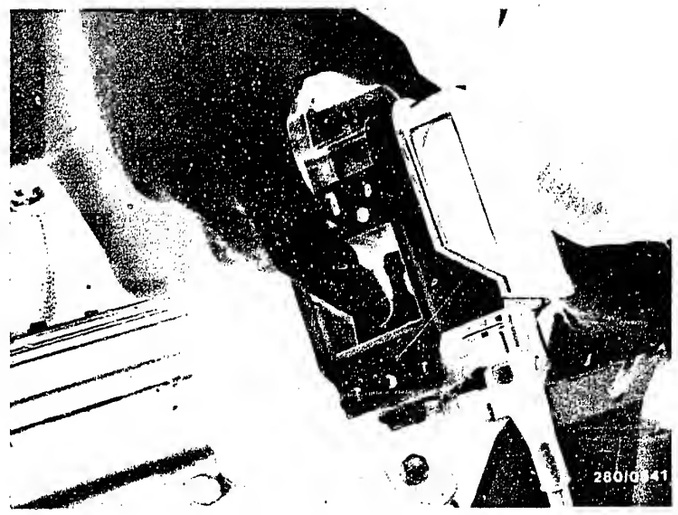
Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor. Connect ohm-meter to term. 7 and term. 8 of air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500 Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000 Ω

yes



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction = richer mixture
Arrows = Fastening screws

Opening the air-flow sensor flap



Continued on J 3/J 4

Fuel consumption too high (continued)

Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.
Caution:
After testing is completed, refit the hose between air filter and air-flow sensor. Securely tighten the hose clamp (leaks).

yes

CO and idle speed correctly adjusted?

no

CO and idle adjustment
Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.
Idle speed

1.9 l engine:	975...1025 min^{-1}
2.0 l engine:	850... 900 min^{-1}

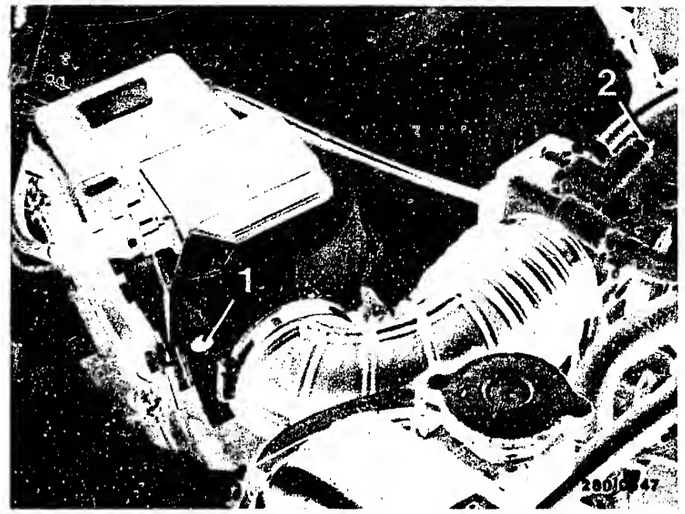
CO adjustment

1.9 l engine:	max. 1.5% by vol. CO
2.0 l engine:	max. 1.0% by vol. CO

Testing the solenoid operated air valve
Let the warmed-up engine idle with the air conditioner off (if fitted). Connect the connecting lead on the solenoid-operated air valve to battery voltage. Engine speed is raised by approx. 150 min^{-1}. If there is no change in engine speed, replace the start valve.

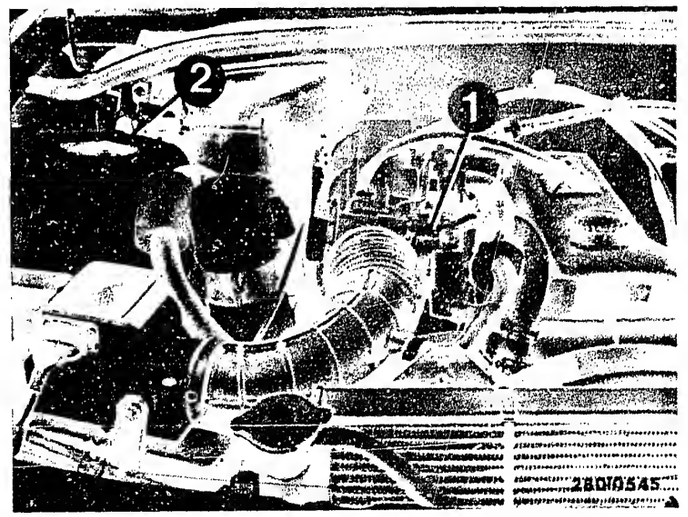
yes

Continued on J5/J6



2.0 l engine (1.9 l engine similar)
1 = CO adjusting screw
2 = Idle-speed adjusting screw

1 = Solenoid-operated air valve
2 = Relay set



Fuel consumption too high (continued)

CO and idle speed correctly adjusted? (continued)

No → If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration again. Carry out adjustments in several steps. After adjusting, use new plugs.

As of FD 246: CO adjusting screw, hexagon-socket-head AF 5.

Yes ↓

Can idle speed not be adjusted?

Yes ↓

Testing completed for customer complaint

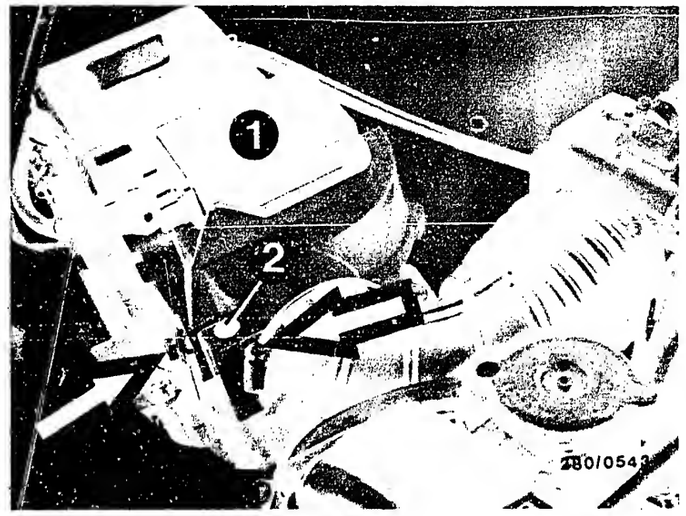
"Fuel consumption too high"

Customer complaint remedied?

No →

Further possibilities:

- Customer complaint incorrectly diagnosed. If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction
= richer mixture
Arrows = fastening screws

Trouble-shooting program according to customer complaints

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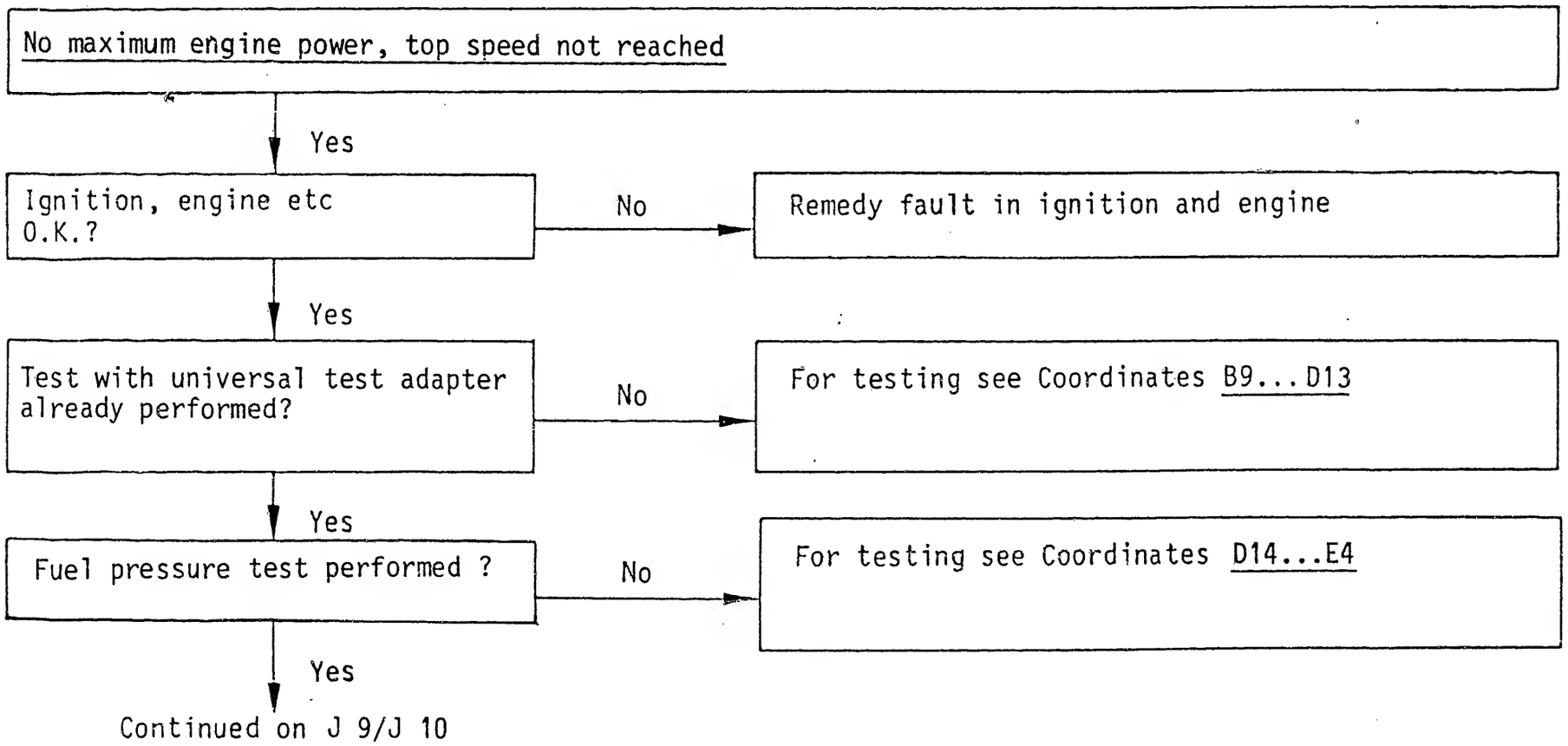
If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.



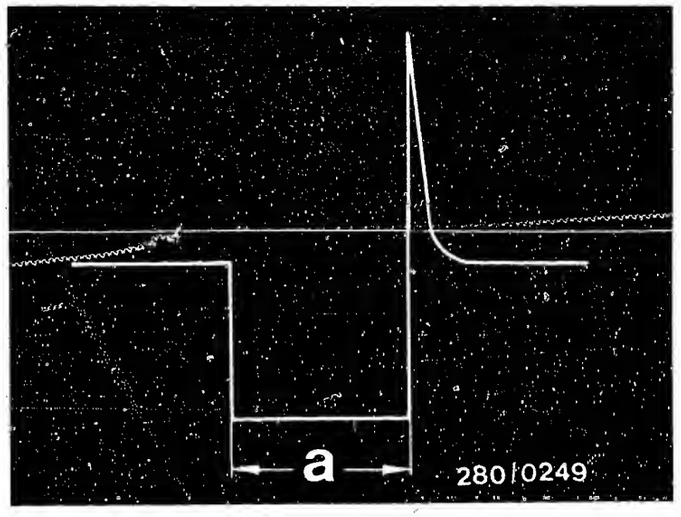
No maximum engine power, top speed not reached (continued)

Full-load enrichment O.K.?

yes

Connect test lead as follows:
The two-pole connectors of the test lead are connected between an injection valve and its connecting lead. Of the other two clamps of the test lead, only one must be connected to the special input of the motortester.
When the correct clamp is connected, the picture opposite will be visible on the oscilloscope.

With the aid of the test lead it is possible to test the injection pulses with an ignition oscilloscope at the injection valves with the engine running.
If the picture opposite is not obtained or if there are deviations (interference, missing etc.), the other injection valves should also be tested.
In case of interference ——> check routing of leads.
In case of missing ——> eliminate loose contacts in leads or in plug-in connections.
Observe injection pulse at idle. Remove throttle-valve switch connector and bridge term. 3 and term. 18 (insulated wire jumper). Caution! Do not bend any of the terminals. Injection pulse must become longer. If not: check connecting leads from multiple plug to throttle-valve switch (term. 3 and term 18) for continuity. If O.K., replace control unit.



Injection pulse of a switched output stage
(measured at injection valve)
a = Pulse length
(dependent on engine load)

Continued on J 11/J 12

No maximum engine power, top speed not reached (continued)

Does throttle valve open fully?

No → Throttle linkage, accelerator pedal O.K.? Straighten linkage if necessary. Throttle linkage may stick due to floor mat etc. Check plug-in connections. Direct resistance measurement at throttle-valve switch between term. 18 and term. 3 (open throttle valve fully).
If necessary, replace throttle-valve switch. Check for open circuit in lead from multiple plug term. 3 to throttle-valve switch term. 3.

Yes

Fuel pressure O.K.?

No → Measuring the fuel delivery.
For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.
Remove air hose to air filter on air-flow sensor. Open air-flow sensor flap by hand until pump operates.

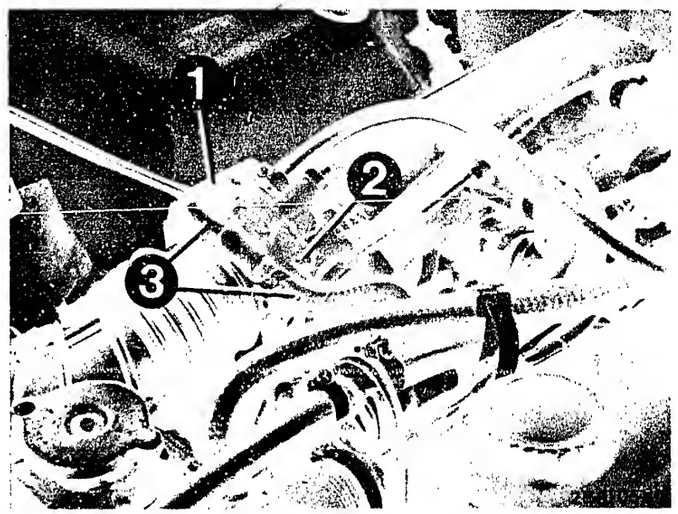
Test specification: min. 675 cm³/30 s

Remedy if test specification not reached:
- Fuel filter clogged replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts; possibly also eliminate poor ground connection; replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.

Refit hose between air filter and air-flow sensor. Check for leaks.

Yes

Continued on J 13/J 14



1.9 l engine (2,0 l engine similar)

1 =Throttle-valve switch
2 =Throttle-valve stop screw
3 =Throttle-valve preheating

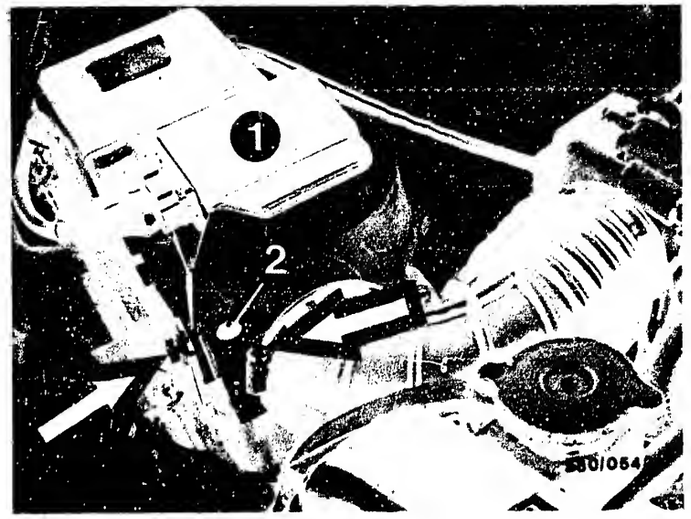
No maximum engine power, top speed not reached (continued)

Air-flow sensor O.K.?

no

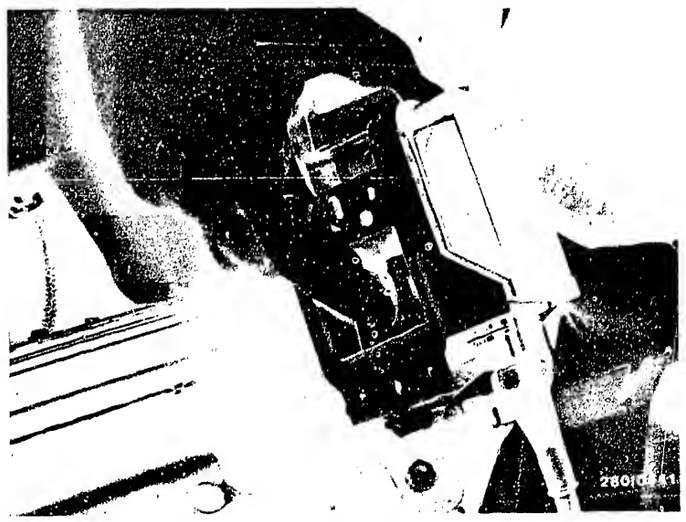
Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor. Connect ohm-meter to term. 7 and term. 8 of air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500 Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000 Ω
Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.
Caution:
After testing is completed, refit the hose between air filter and air-flow sensor. Securely tighten the hose clamp (leaks).

Yes



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction = richer mixture
Arrows = Fastening screws

Opening the air-flow sensor flap



Continued on J 15/J 16

No maximum engine power, top speed not reached (continued)

Are all hose lines and electric leads securely attached? Visual examination. Is the air-intake system leak-tight?

No → Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked, or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak. Check electric contacts for loose connection.

Yes

Testing completed for customer complaint "No maximum engine power".
Customer complaint remedied?

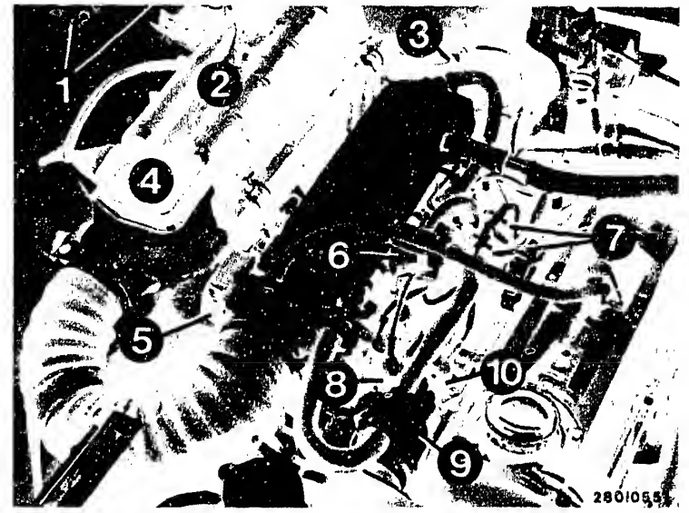
No →

Further possibilities:

- Customer complaint incorrectly diagnosed.

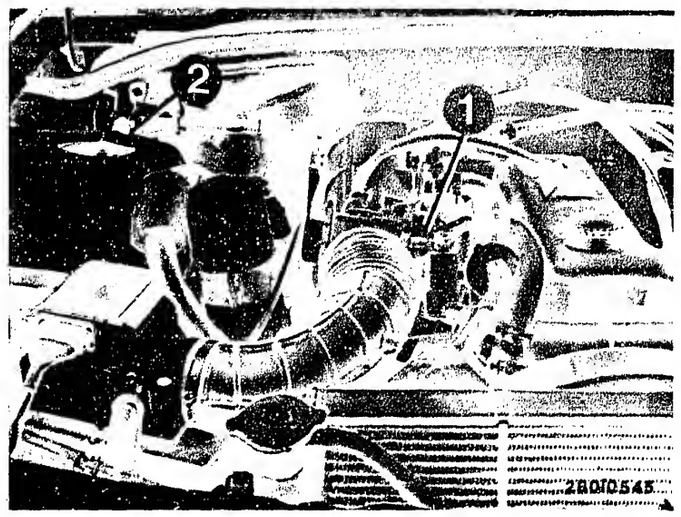
  If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).

- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



3 = Start valve (blue plug) (only on 1.9 l engine)
4 = Air-flow sensor
5 = Throttle-valve switch
8 = Thermo-time switch (brown plug) (only on 1.9 l engine)
9 = Auxiliary-air device (black plug)
10 = NTC II (white plug) (blue on 2.0 l engine)

1 = Solenoid-operated air valve
2 = Relay set



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into three rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row and carry out the tests given there.

When you have finished testing, continue trouble-shooting at the point at which you branched off.

CO adjustment at idle too low or too high

↓ Yes

Ignition, engine etc O.K.? — No → Remedy fault in ignition and engine

↓ Yes

Test with universal test adapter already performed? — No → For testing see Coordinates B9...D13

↓ Yes

Fuel pressure test performed ? — No → For testing see Coordinates D14...E4

↓ Yes

Continued on J 19/J 20

CO adjustment at idle too low or too high (continued)

CO and idle speed correctly adjusted? Solenoid-operated air valve O.K.?

no →

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed

1.9 l engine:	975...1025 min^{-1}
2.0 l engine:	850... 900 min^{-1}

CO adjustment

1.9 l engine:	max. 1.5% by vol. CO
2.0 l engine:	max. 1.0% by vol. CO

Yes ↓

Can idle speed not be adjusted?

no →

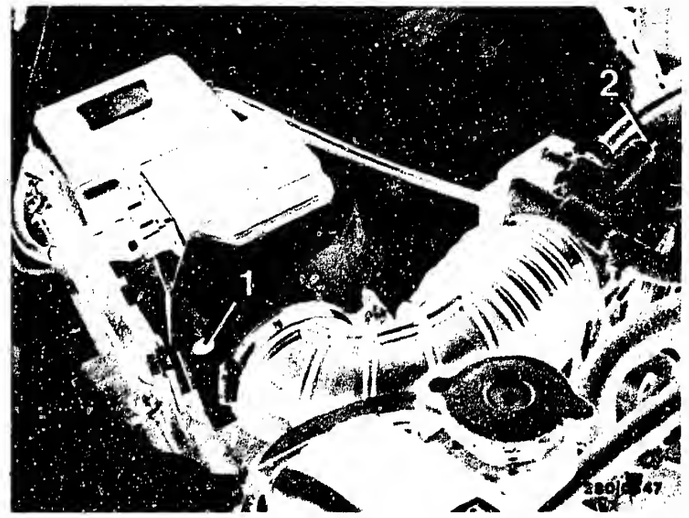
Testing the solenoid-operated air valve

Let warmed-up engine idle with the air conditioner (if fitted) switched off. Connect connecting leads on solenoid-operated air valve to battery voltage. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve. If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration again. Carry out adjustments in several steps. After adjusting, use new plugs.

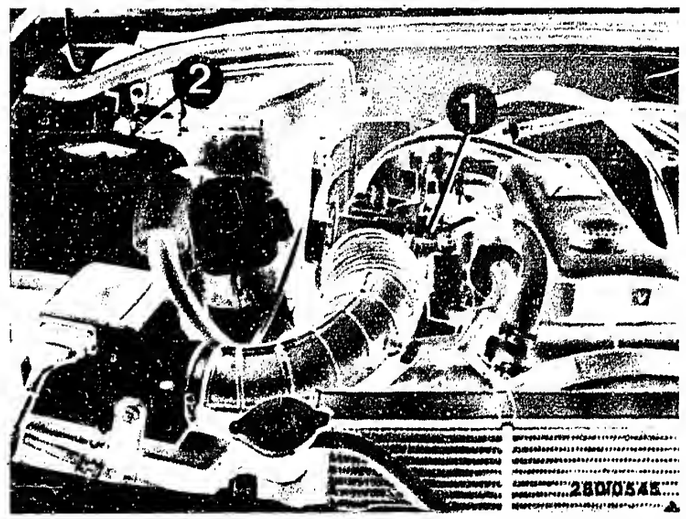
As of FD 246: CO adjusting screw, hexagon-socket-head AF 5.

Yes ↓

Continued on J21/J22



1 = CO adjusting screw
2 = Idle-speed-adjusting screw



1 = Solenoid-operated air valve
2 = Relay set

CO adjustment at idle too low or too high (continued)

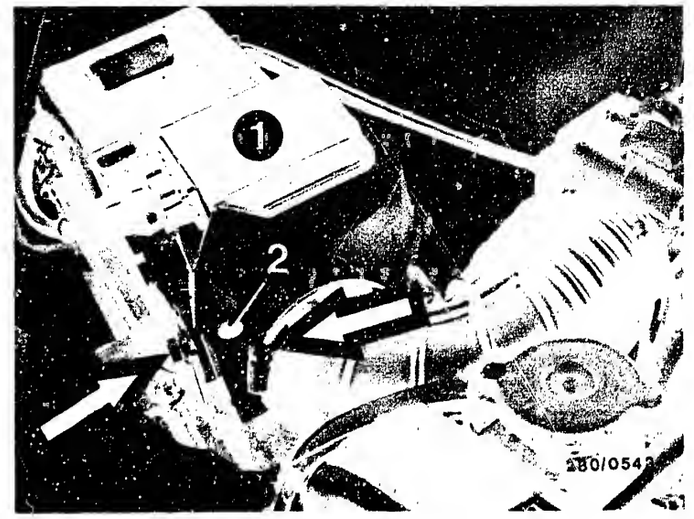
Air-flow sensor O.K.?

no →

Testing:
Remove hose between air filter and air-flow sensor. Open air-flow sensor flap by hand. It must be possible to move the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. The sensor flap must not catch when it is being opened. Watch for signs of abrasion or rubbing. Clean the air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are signs of abrasion or rubbing, replace the air-flow sensor. Connect ohm-meter to term. 7 and term. 8 of air-flow sensor. Measure resistance. Deflect air-flow sensor flap.
Test specifications:
Air-flow sensor 0 280 200 003, ...202 006, ...202 009: 100...500 Ω
Air-flow sensor 0 280 202 006 as of FD 141: 200...1000 Ω
Manta A:
To remove the air-flow sensor, loosen the silent block on the angle plate and loosen the air hose (see arrows). Open the 4 clamp fasteners on the air filter.
Other vehicles:
To remove the air-flow sensor, open the 4 clamp fasteners on the air filter and loosen the air hose.
All vehicles:
Unscrew the 4 fastening screws of the air-flow sensor from inside the top part of the air filter.
Caution:
After testing is completed, refit the hose between air filter and air-flow sensor. Securely tighten the hose clamp (leaks).

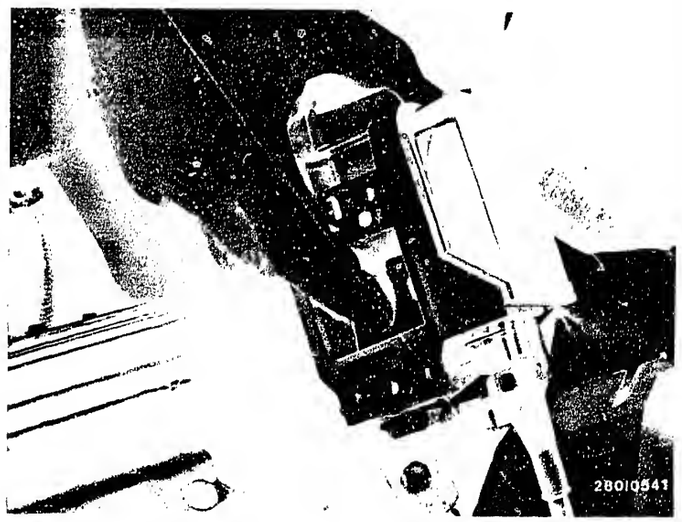
Yes

Continued on J 23/J 24



2.0 l engine (1.9 l engine similar)
1 = Air-flow sensor
2 = Bypass screw (CO adjustment)
Turning in a clockwise direction = richer mixture
Arrows = Fastening screws

Opening the air-flow sensor flap



CO adjustment at idle too low or too high (continued)

CO concentration below tolerance?

1,9 l engine:
max. 1,5 % by vol. CO

2,0 l engine:
max. 1,0 % by vol. CO

Temperature sensors O.K.?

Start valve leak-tight?

(only on 1,9 l engine)

No →

Testing the temperature sensor:
Using ohmmeter, make direct resistance measurement at temperature sensor II (engine). Resistance measurement at term. 13 and term. 49 (ground);

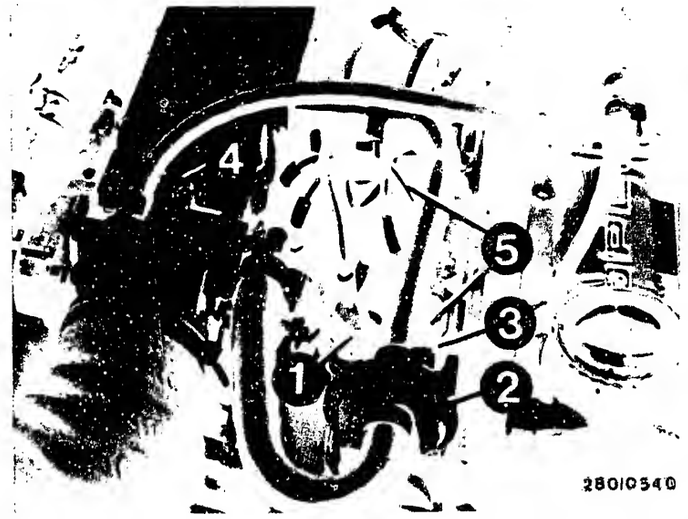
at ambient temperature (approx. 15...30°C):	1,3...3,6 kΩ / 1,45...3,3 kΩ [1]
with engine at normal operating temperature (approx. 80°C):	250...390 Ω / 280...360 Ω [1]

If incorrect, check for open circuit or short circuit in following leads using ohmmeter: Multiple plug term. 13 to temperature sensor II term. 13 and temperature sensor II term. 49 to central ground (lead 49). Check all contacts in the plug-in connections.
Testing the start valve for leaks:
1. When installed
Pinch off the fuel delivery line to the start valve. If engine then runs smoothly, replace start valve.
2. When removed
Remove start valve (Caution! Fire Hazard!). Fuel line and electric lead remain connected (place collector vessel under the start valve). Build up fuel pressure (remove hose between air filter and air-flow sensor. Ignition "ON" and deflect air-flow sensor flap).
Test specification: Within one minute max. 1 drop may form at the mouth of the valve.
Caution! After the test is completed, the hose between air filter and air-flow sensor must be fitted again. Make sure the hose clamp is tight.

1) Applies only to 2.0 l engine

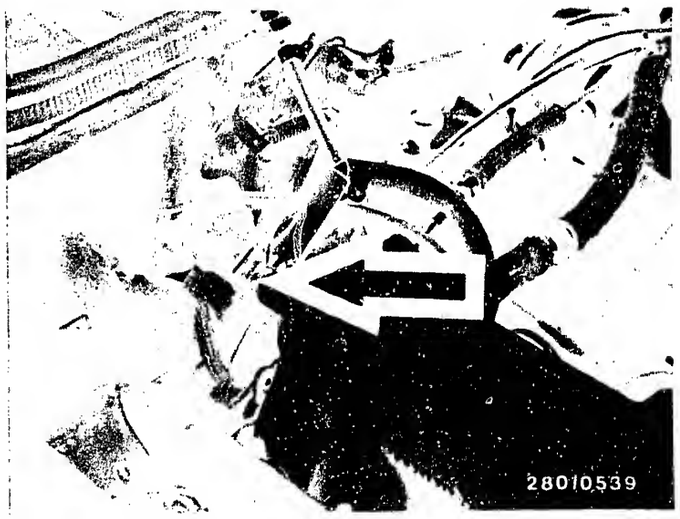
Yes

Continued on K 1/K 2



3 = Temperature sensor II (engine)

Arrow = Start valve



CO adjustment at idle too low or too high (continued)

CO concentration above tolerance?

0,3 % vol. CO

Air-intake system leak-tight?

No →

Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Remove hose after auxiliary-air device and blow air (0.3 bar) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

Yes ↓

Testing completed for customer complaint "CO-Setting".

Customer complaint remedied?

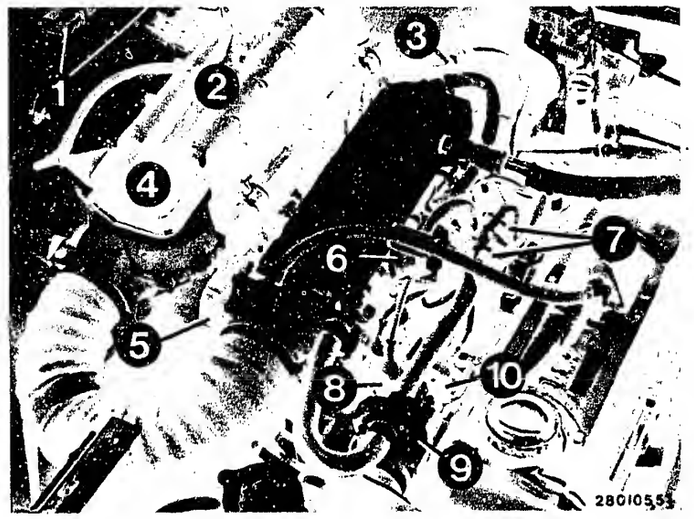
No →

Further possibilities

- Customer complaint incorrectly diagnosed.

  If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (see coordinates B3 - B8).

- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



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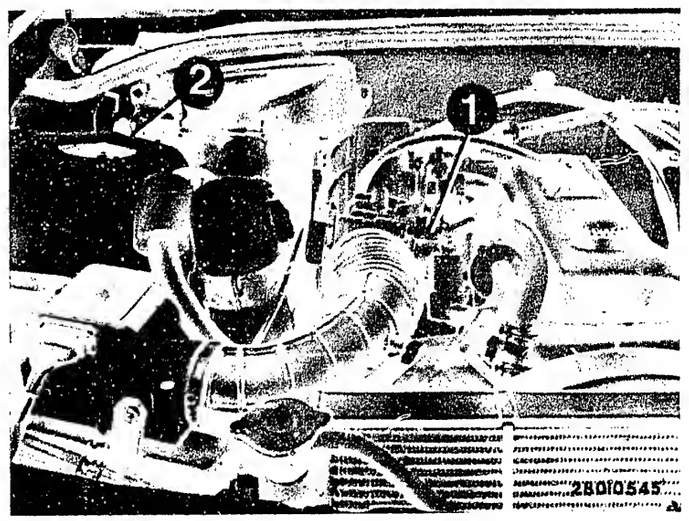
1 = Solenoid-operated air valve
2 = Relay set



After-sales Service

Technical Bulletin

L-JETRONIC and
TCI-h "Hybrid"

VDT-I-280/102 En
7.1981

Please note:

TCI-h trigger boxes in hybrid construction form can not yet be fitted into vehicles with L-Jetronic.

By means of the internal current limiting of the trigger boxes, impulses are created which enter the L-Jetronic control unit from terminal 1 of the ignition coil. Because of these additional impulses more fuel is injected than is necessary.

This means therefore: higher fuel consumption,
out-of-true engine running and
bad acceleration behaviour.

A new TCI-h of the conventional kind (without internal current limiting) with part no. 0 227 100 916 has therefore been delivered for vehicles with a 4 cyl. engine with L-Jetronic.

The supplementary-equipment set 0 227 100 916 is intended at first for the following vehicles:

Opel-Kadett C	GT/E	1.9 l	with ignition distributor 0 231 170 154 ... 235
Opel-Kadett C	GT/E	2.0 l	
Opel-Kadett Rally		2.0 l	
Opel-Manta	GT/E	2.0 l	
Opel-Rekord E		2.0 l	
VW-Beetle Automatic		1.6 l	with ignition distributor 0 231 170 044 ... 046 ... 048 ... 093

BOSCH
Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung
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After-sales Service

Technical Bulletin

CAR ALARM II, RETROFITTING

in vehicles equipped with L-Jetronic

VDT-I-280/103 En

7.1981

Supersedes Ed. 9.1980

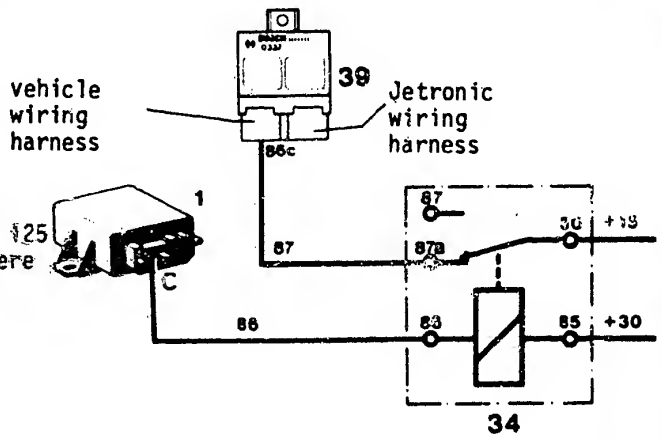
In cases where Car Alarm II (0 335 411 901) is retrofitted in vehicles equipped with L-Jetronic, the terminal 1 of the ignition coil must NOT be connected to terminal "C" of the alarm relay. When the Car Alarm is switched on, terminal "C" of alarm relay is switched internally to vehicle ground. This would mean that when attempts are made to start the vehicle with the alarm switched on, the ignition coil and the L-Jetronic control unit would be destroyed.
This also means though, that full protection against theft is no longer possible as would normally be the case with the ignition switched off and with the alarm installation primed.

A circuit has now been developed which ensures complete theft protection for L-Jetronic vehicles as well.

Description of the circuit

Open-circuit the line "15" leading to terminal "86c" of the relay set using an additional relay (34) 0 332 204 125. This relay ensures that when the alarm installation is primed, the supply voltage to the control unit is switched off and hence the control unit no longer functions.

The additional relay (34) 0 332 204 125 is controlled by terminal "C" of the alarm relay (see circuit diagram).



1 Alarm relay
34 Additional relay 0 332 204 125 (transfer-contact relay, here used as break contact)
39 L-Jetronic relay set

After-sales Service

Motor Vehicle Service Information

Opel Ascona-B, Manta-B

VDT-I-OPE 005 B

10. 1977

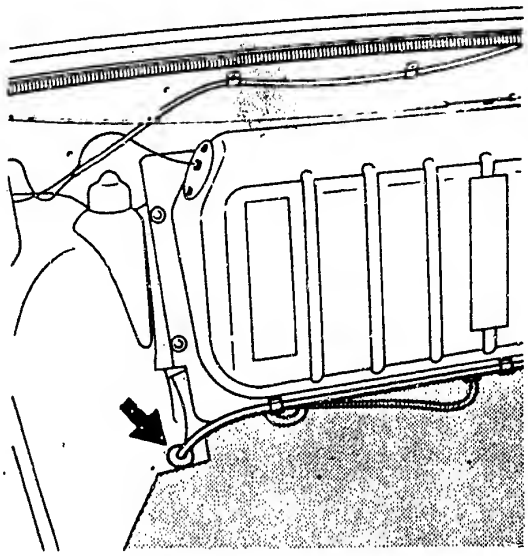
with L-Jetronic

Failure of injection valves 0 280 150 . . .

On the above-mentioned vehicles up to chassis no. 61 243 738 (May 1976) failure of the injection valves may occur due to corrosion or contamination.

Result: Engine misfiring.

A possible cause may be the unsatisfactory positioning of the fuel-tank-ventilation hose. The open end of the fuel-tank-ventilation hose is in the region of the left-hand wheelbox, as seen from the rear of the vehicle (see illustration). Especially in the winter months this may lead to serious contamination of the fuel-tank-ventilation hose, and as a result it is possible that dirt and salt water may be sucked into the tank.



In order to avoid this, the fuel-tank-ventilation hose is positioned in the right-hand chassis member as from the chassis no. mentioned above. Several holes drilled in the chassis member ensure satisfactory ventilation of the fuel tank.

In the case of complaints about the injection valves the satisfactory positioning of the fuel-tank-ventilation hose should be checked and if necessary corrected by an Opel dealer.

If, on vehicles up to chassis no. 61 243 738, injection valves fail due to water or dirt sucked in through the fuel-tank-ventilation hose, warranty claims should be rejected.

The provisional special ruling announced in Circular KH/VKD 3 of 3. 3. 77 is hereby rendered void.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

OPEL ASCONA B 400 VDT-I-OPE 018 En

with L-Jetronic 5.1980

Since Autumn 1979 Opel have been delivering the Sports Limousine B 400. The vehicle is fitted with a Cosworth engine (16 valves) with 4 cyl. 2.4 l, 106 kW (144 HP).

L-Jetronic

The fuel-injection system corresponds to the already familiar L-Jetronic system in the Opel 2.0 E.
Difference: The air-flow sensor 0 280 202 020 is specially designed for this engine.

Ignition point

21° BTDC at engine speed 2500 min^{-1} without vacuum.

Technical documentation

Equipment: : see microfiche

Trouble-shooting instructions: Only a limited number of these vehicles are being produced and used for racing. It is not, therefore, proposed to distribute the usual documentation (repair manual). For checking the system with the analog tester, the instructions VDT-W-280/500 (Opel 2.0 E) can be used.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

UNIVERSAL TEST ADAPTER

VDT-I-Gen. 1001 En
1.1982

1. Application

The multiplicity of different fuel-injection and ignition systems at present available on the market, as well as the advances in development which can be expected in the future, demand a new testing concept. In order to maintain the outlay for test equipment, and hence the costs, at a reasonable limit we have developed the universal test adapter.

The following systems can be tested using a test-adapter universal unit together with adapter leads suited to the system in question:

1.1 Systems which are already being fitted as series:

- L-Jetronic (1st generation)
- LE-Jetronic (2nd-generation L-Jetronic)
- Motronic (with the new connector designation, refer to the vehicle-specific instructions!)

1.2 Systems whose introduction is planned:

- Motronic with gearbox control
- KE-Jetronic
- Mono-Jetronic
- Electronic ignition system with ignition map (EZF)

2. Delivery dates and Part Numbers

Available as from 2.1982.

2.1 Universal test adapter (basic unit)

Part Number: 0 684 101 801

Designation: ETT 018.01

2.2 System adapter lead for LE-Jetronic (2nd-generation L-Jetronic)

Part Number 1 684 463 123

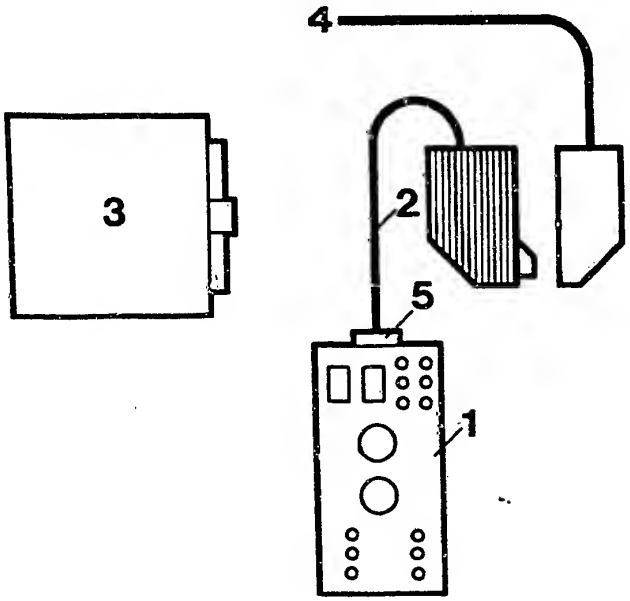
First application: For BMW 2.5/2.8 l engines as from 9.1981, and for Opel 2.0 l engines (Manta/Rekord) as from 9.1981.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung.

3.2 Adapter lead for peripheral testing (Model 2)

The universal test adapter with system adapter lead, is only to be connected to the system wiring harness (e.g. LE-Jetronic (2nd-generation L-Jetronic)).

To be tested: Wiring harness with components (without control unit).



1 = Universal test adapter (basic unit)
2 = System adapter lead
3 = Control unit (not connected)
4 = System wiring harness
5 = Plug connection

4. Construction of the universal test adapters

The universal test adapter is fitted with 2 program switches footage and resistance measurement. The measured values are displayed on the multimeter connected to the universal test adapter. For reasons of safety, the voltage and resistance sockets are separated. In order to measure signals (e.g. injection pulses, ignition pulses), it is necessary to connect a Motortester to the measuring cavities (special input).

When carrying out functional tests with the control unit connected, selected push-buttons are pressed in a number of test-program steps in order to simulate a variety of different engine operating conditions the influence of which is evaluated using the Motortester.

2.3 System adapter lead for Motronic with new connector assignment.

(Refer to the vehicle-related instructions!)

Part Number : 1 684 463 124
First application: Porsche 944 as from series production, BMW as from about 3.1982 (Europe)

2.4 System adapter lead for L-Jetronic (in preparation)

Further system adapter leads will be made available along with the introduction of the new systems as mentioned above.

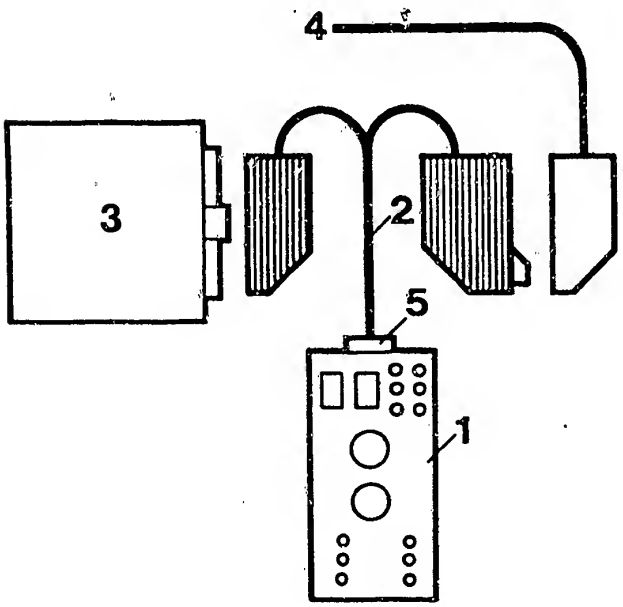
3. Testing procedure

The systems and the components are tested for voltage and resistance values as well as for correct functioning. Evaluation is by means of a multimeter and the Motortester which are connected into the universal test adapter.

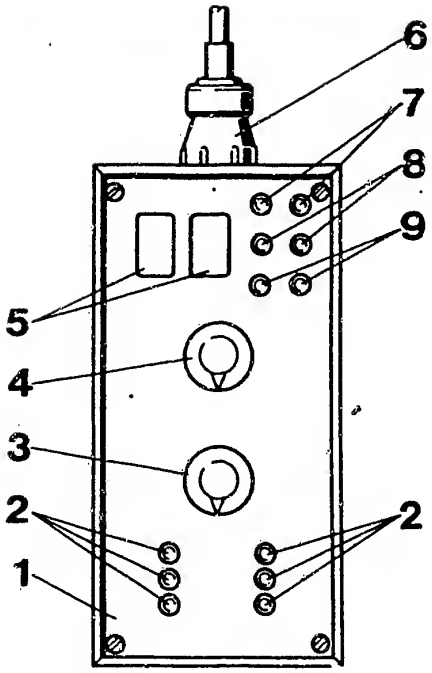
Depending upon the complexity of the system, interchangeable adapter lead model 1 or model 2 is provided:

3.1 Adapter lead for peripheral and function testing (Model 1)

The universal test adapter together with the system adapter lead is to be connected to the system wiring harness and to the control unit (e.g. Motronic).
To be tested: Wiring harness with components and control unit.



1 = Universal test adapter (basic unit)
2 = System adapter lead (Y-version)
3 = Control unit
4 = System wiring harness
5 = Plug connection



1 = Universal test adapter (basic unit)

2 = Keyboard for simulation of various conditions e.g. engine temperature, throttle position etc.

3 = Program switch "Ohm" for resistance measurement

4 = Program switch "Volt" for voltage measurement

5 = Measurement "cavities" (for the special input from the Motortester)

6 = 63-pole plug-in connection for connecting the system adapter lead

7 = Measurement sockets (voltage measurement with a multimeter or with the Motortester)

8 = Measurement sockets (resistance measurement with the multimeter)

9 = Sockets for special functions (not yet allocated)

Notes:

1. The Motronic test adapter (0 684 101 800, ETT 018.00) will continue to be used for Motronic-equipped BMW vehicles (with old connector assignment) up to about year of manufacture 3.1982 (refer to vehicle-specific instructions).

2. Details on the operation of the universal test adapter, and the test specs, are to be found in the vehicle-specific after-sales service instructions.

3. Caution! Change of Part Number:

On the SIS-microfiches OPE-00/J22 (Coordinates A14 and A17) the new Part Numbers are as follows:

Universal test adapter: 0 684 101 801

Adapter lead : 1 684 463 123

Table of contents

When direct trouble-shooting a specific L-Jetronic component, it is absolutely essential to look up the respective test step according to the customer complaint.

Table of contents (continued)

Table of contents (continued)

Table of contents (continued)

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